FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

Vol. 83 Thursday, January 12, 1950 No. 1741

49, Wellington Street, London, W.C.2
Grams: "Zacatecas, Rand, London"
'Phone: Temple Bar 3951 (Private Branch Exchange)
PUBLISHED WEEKLY: 26s. per annum (Home and Overseas)

Official Guesswork

Because ironfoundry production seems to follow the general trend of steel output—say 1 of iron castings to 4.3 of steel—the foundry executive should study the particularly depressing Report on European Steel Trends.* Summarised, this Report states that in 1953 the output of steel in Europe, excluding the U.S.S.R., should be of the order of 70 million tons. Of this quantity, Europe itself should consume—if trade be good—about 58 million tons. Then, exports to non-European countries should be 4,100,000 tons, leaving a surplus of 8 million tons. The first observation that comes to mind is that the 8,000,000 tons would obviously not be made. A corresponding condition in the production of iron castings would involve a slump of the first magnitude. The next comment is that statistics based on aggregating a quantity of miscellaneous products and labelling them "steel" is open to criticism. To make an analogy with foundry practice: one could easily imagine conditions involving a slump in motor-car production and simultaneously a boom in the output of tunnel segments and heavy pipes. Then by lumping up the output figures, the parlous condition of the motor-car foundry would not be noticed.

These gloomy prognostications about steel have been produced in Geneva, and we cannot help but feel that the mental depression we have invariably experienced in that particular city must have encompassed those persons responsible for this Report. Where it fails, to our mind, is in the assumption that the conditions in 1953 will be such that production capacity will be provided to furnish a matter of 8,000,000 tons surplus to requirements. The amount of reconstruction still to be undertaken on the Continent of Europe and in this country is enormous. In fact, the replacement of war-damaged buildings and plant has not yet started, in so far as the larger installations are concerned. In this connection, there is too little recognition of the fact that "work makes work." The building of 100 blocks of offices and 20 new hotels does not end in the amount of steel used in their construction. There are the fittings, furniture and supplies, which involve, either directly or indirectly, the need for steel. Again, if rearmament seriously takes the stage, the steelmaking capacity of Europe would be quickly absorbed. The main argument of the Report concerns the industrialisation of non-European countries, but this can, because of the extra spending capacity of the population, create a demand for goods made of steel—not produced locally—involving extra machinery at home for their making. Whilst the late Henry Ford's reference to the Hottentot living like a Fifth Avenue millionaire is an obvious exaggeration, there is a germ of common sense in his statement, and, moreover, sufficient to make hay-wire of industrial trends.

What is wrong with this Report and many others of a like character is that subconsciously the compilers are still thinking in terms of unlimited labour and an inexhaustible supply of raw materials, neither of which is available to-day. Whilst the ironfoundry industry is distinctly more varied than the steel trade (and in this connection we have never yet known the whole of the former suffering from an intense depression) we envisage that in a few years' time there will be heavy demands for certain types of steel production side-by-side with a curtailment in others. Structural steel may not follow the same trend as steel sheets for tinning or car bodies, and permanent-way replacement may not be of the same order as the demand for ships' plates. Experience has shown that but few of the internationally known economists have been correct in their prognostications of future trends. Events, such as a few years of bumper harvests, the discovery of manganese ore in the Gold Coast, or copper deposits in Rhodesia and the Congo, all have confounded the learned outpourings of the academic "Old Moores." In this age of state planning—invariably a precursor of dictatorships—of course anything might happen to expand or decrease industrial production.

*Prepared by the Steel Division, Economic Commission for Europe, Geneva. Price 3s. 9d.

Contents

Official Guesswork, 29.—New Year Message from Mr. N. P. Newman, 30.—Luncheon: Ruston & Hornsby, Limited, 30.—Dinner: Joint Iron Council, 30.—Can the Manufacture of Malleable Cast Iron be Improved? 31.—Exports of Lead Manufacturers, 38.—Bin Level Indicators, 38.—A Modern Foundry Equipment Works, 39.—F.B.I. Opens Canadian Office, 41.—Barrow Hematite Excluded from Steel Act, 41.—Pattern Equipment for Production Moulding, 42.—Darwin's Position: Capital Intact, 43.—Thermal Properties and Chilling Power of Some Non-metallic Moulding Materials, 44.—Scottish Light Castings, 45.—Hydraulic Working Platform, 45.—Foundry Expansion Opposed, 46.—Woodall-Duckham's New Chairman, 46.—Personal, 47.—New Year Honours List, 48.—Exchange of Scientific Information, 49.—News in Brief, 50.—European Steel Production Programme, 51.

New Year Message from Mr. N. P. Newman

This is my first New Year message to you all as Chairman of the Council of Ironfoundry Associations.

A famous American newspaper used to remind its readers daily that "the only constant thing is change." As an industry, and as a nation, we dismiss the difficulties of the old year as we begin to face the uncertainties of the new. There were troubles, and threats to our industrial security, in 1949; yet we, as ironfounders, managed to make and sell the greatest tonnage of iron castings ever recorded.

Shall we fare as well in the coming year?

The sellers' market has gone, and with it any complacency induced by an over-full order-book. We are told that it may be harder to sell overseas next year. At home, we face all the grave uncertainties of a general election and the interruption of normal business activity which that event occasions. The ironfounding industry is a robust industry. It has been adapting itself to changing conditions for more than a century. Ironfounders themselves are strong individualists. In post-war years you have wedded your own sturdy independence to the cause of voluntary co-operation and mutual help.

In recent months, I have been impressed by the remarkable spirit of progress which permeates the ranks of management in the ironfounders' associations. This spirit has been observed and praised by men eminent in industries not directly linked with our own. If for a space, after the war, there was any confusion of purpose or any apathy that fresh tasks should voluntarily be assumed, that period is ended.

MR. N. P. NEWMAN, J.P., CHAIRMAN OF THE COUNCIL OF IRONFOUNDRY ASSOCIATIONS, AND PRESIDENT OF THE INSTITUTE OF BRITISH FOUNDRYMEN AND THE NATIONAL IRONFOUNDING EMPLOYERS' FEDERATION.

We shall, I am confident, in 1950 make every possible effort to march vigorously forward along the road of progress. As a confirmed individualist, I am quite sure that the pace of freedom is always faster and surer than the frustrated shuffle of a nationalised chain gang. The most efficient foundries are helping the average to do better. We shall have the leavening influence of our research association's advisory team, and the lessons gained from the productivity team's visit to America. These are signs of the industry's resolve to help itself and determine its own future.

I wish each of you health, strength and the greatest success in the coming year.

N. P. NEWMAN

Dinner

Joint Iron Council

A farewell party in honour of the General Ironfounders' Productivity Team was given by the Joint Iron Council at the Great Northern Hotel, Kings Cross, London. Mr. F. Scopes presided. In addition to the team, there were present:—Mr. N. P. Newman; Mr. R. B. Templeton; Mr. V. C. Faulkner; Dr. J. G. Pearce; Mr. D. Graham Bissett; Mr. Malcolm Glenny; Mr. A. Watson; Mr. F. Arnold Wilson; Mr. T. Clark and Mr. J. Butler.

Luncheons

Ruston & Hornsby, Limited

To celebrate the opening of the new Beevor Foundry, the board of directors of Ruston & Hornsby, Limited, entertained to luncheon a large and distinguished company. Amongst those present were:—Mr. H. Riggall (who presided), Field Marshal Sir William Slim, the Lord Bishop of Lincoln, Col. Sutton-Helthorpe, Mr. V. R. Prehn, Dr. J. E. Hurst, Mr. G. P. Barnett, Mr. O. Waris, Brigadier E. F. O. Richards, Mr. J. W. Lawson (deputy Mayor of Lincoln), Mr. George Deer, M.P., Mr. E. W. Spalding, Mr. E. Everitt, Dr. J. G. Pearce, Mr. R. Henderson-Tait, Mr. R. C. Shepherd, Sir John Greaves, Mr. V. C. Faulkner, Sir George Cuffe, Mr. C. V. Armitage, Mr. J. T. Graham, Mr. W. Haynes, Mr. E. R. Jones, Mr. G. W. Bone, Mr. W. T. Bell, Mr. A. Swain, Mr. J. H. Smith (Town Clerk), Major A. D. G. Llewellyn (A.D.C.), Mr. A. V. Waddell, Mr. J. W. F. Hill, Mr. D. H. Wood, Mr. S. Brooks, Mr. F. N. Lloyd, Dr. E. R. Walton, Mr. V. L. Cashmore, and Mr. F. Webster.

Stone-Wallwork, Limited

This firm of foundry engineers entertained the General Ironfounders' Productivity Team (leader Mr. S. H. Russell) at a farewell luncheon party. The luncheon was held last Tuesday at the Savoy Hotel, Mr. F. A. G. Powell-Jones presiding. In addition to the team, there were present:—Sir Holland Goddard; Sir Lyonel Kearns; Mr. N. P. Newman, J.P.; Mr. J. J. Sheehan, B.Sc.; Mr. R. B. Templeton; Mr. W. H. Harper; Mr. F. P. Bartlett and Mr. J. A. Todd (first and second secretaries respectively of the American Embassy); Mr. F. Paradise; Mr. A. Jury; Mr. C. Constantine; Mr. J. G. Gardom; Mr. A. E. McRae Smith, M.A.; Mr. V. C. Faulkner; Mr. V. Delport; Mr. W. Tait, M.C., and Mr. A. J. Brown.

THE DAILY MAIL IDEAL HOME EXHIBITION, which is to open at Olympia on March 7, is to contain a 75-ft. high aluminium parabolic arch designed by Mr. Sergei Kadleigh, A.R.I.B.A., and manufactured by J. Starkie Gardener, Limited, of Southfields.

Can the Manufacture of Malleable Cast Iron be Improved?*

By S. W. Palmer, A.R.I.C., A.I.M.

The purpose of this Paper is to deal with a number of the problems that arise from day-to-day during the manufacture of malleable cast iron. An attempt has been made to consider these problems in the light of the research work that has been carried out and reported in numerous published works.

THE primary concern of foundrymen and metallurgists in the malleable iron industry is to manufacture as cheaply and quickly, and as efficiently as possible a malleable iron which consistently fulfils all the requirements stipulated by the purchaser of the castings and by the British Standard Specifications. These foundrymen and metallurgists, so busily occupied with the many difficulties that arise from day-to-day in a foundry, have very little time and opportunity to give serious thought to subjects which receive frequent mention nowadays in technical papers concerned with malleable cast iron. Such phrases as "temper-carbon nodule" number, "cementite decomposition," "hyper-eutectoid cementite" and so on, they are inclined to regard as being far removed from the business of making a good malleable cast iron.

It should be appreciated that malleable cast irons, whiteheart, blackheart and any material developed from them, such as pearlitic malleable, are manufactured by a number of large foundries, but also by many small foundries, by foundries having laboratories and by many having very little technical control or guidance. It is therefore often the case that the answer to a problem in one foundry may not be the complete answer in another. Furthermore, while a number of plants making malleable iron are operating efficiently, and are in a position to obtain direct benefits from the results of research work, there are many more which in one way or another should find it possible to improve on their present processing. It is to this latter group that the greater part of the Paper is directed.

Occurrence of Mottle

There is at least one feature that can be said to be common to all foundries making good-quality malleable. It is most important that all castings, regardless of section size, should be completely white and free from mottle in the as-cast condition. Should any mottle occur, then one must expect a reduction in mechanical properties, and have not malleable castings, but poor grey-iron castings with the micro-structure shown in Fig. 1, if mottle is severe. There are three main factors involved in the occurrence of mottled iron in both whiteheart and blackheart, namely: carbon content, silicon content and section size. Of these, section size is usually the one that cannot be adjusted and attention has to be centred upon the control of carbon and silicon content.

It is readily appreciated that the higher the total carbon content of a malleable iron, then the lower are its mechanical properties, and the more likely it is to contain mottle. On the other hand, the lower the total carbon content of a malleable iron melt, the more difficult does it become to ensure that the metal will be sufficiently fluid to obtain fully run and completely sound castings. Obviously, a compromise has to be made between these two considerations, with preference tending to be shown more to the use of a higher-carbon, more fluid iron. With regard to silicon content, it is becoming more appreciated that this element very largely determines the speed of annealing, or rather the rate of decomposition of the white iron at a given annealing temperature. It also

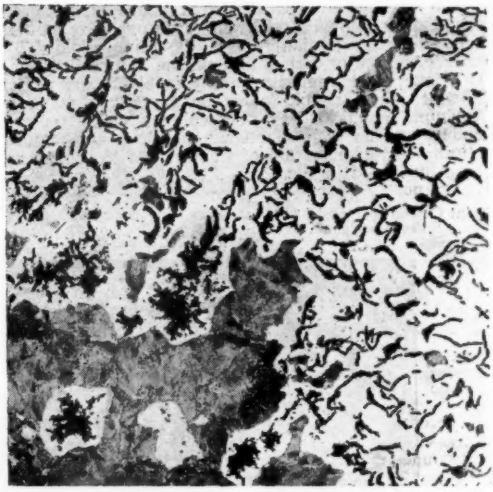


FIG. 1.—FLAKE-GRAPHITE STRUCTURE PRODUCED BY SEVERE MOTTLING OF THE ORIGINAL WHITE IRON. ETCHED, × 60.

encourages the formation of mottle in the hard iron casting if allowed to get too high. Here again, a compromise is necessary and the aim should be to use as high a silicon content as possible without causing the formation of mottle.

With total carbon and silicon contents suitably fixed to suit the section size of the castings being made, there are still several variables that can cause mottle. These are concerned principally with the conditions under which the metal is melted and cast. It has been observed that metal melted in direct contact with the fuel, such as with coke in cupola melting, is more susceptible to mottling than metal melted away from the fuel, yet poured at the same temperature, the extreme case of this being crucible melting.

*A Paper read before the Birmingham, Coventry and West Midlands Branch of the Institute of British Foundrymen, Mr. H. G. Hall presiding. The Author is on the staff of the British Cast Iron Research Association.

Improvement of Malleable

It is difficult to apply any general rules to this variable, and only experience with one's own melting units can give the necessary answers. It is worth noting, however, that in cupola melting of whiteheart the first metal down after starting the furnace or restarting the furnace very often produces mottled castings. This metal should be pigged or used to cast annealing pots. Also, during the melting of the iron, there is a pick-up of sulphur from the fuel. This pick-up, quite naturally, is more considerable if the metal is in direct contact with the fuel, and cupola-melted whiteheart iron normally has a relatively high sulphur content for this reason. Now, an increase in sulphur content in a melt reduces mottle. An increase in manganese content also reduces mottle, but not so readily as sulphur. When sulphur and manganese occur together in a melt they combine chemically to form manganese sulphide, which can be assumed to have no influence on the formation of mottle. If there is still some sulphur left over after all the manganese in a melt is combined as manganese sulphide, then that spare sulphur helps to reduce mottle, but at a later stage, when annealing is carried out, this excess sulphur, as shown later, may have a harmful effect.

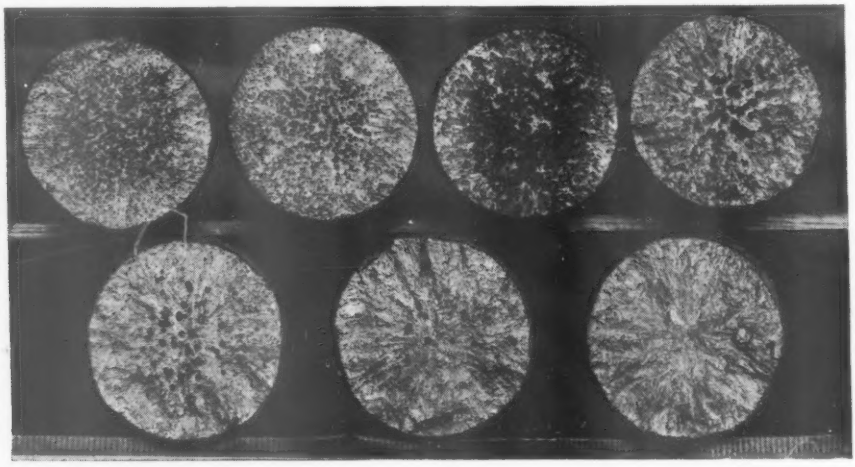
On the other hand, if all the sulphur in a melt is used up in forming manganese sulphide and there is a little manganese to spare, then, as manganese has only a mild effect compared with sulphur in offsetting mottle, it is principally a matter of mottle being avoided by correct balance of carbon and silicon, and section size. This latter case applies primarily in blackheart melts, in which there should never be any excess sulphur. A simple practical way of keeping a check on the tendency of an iron to contain mottle is the regular pouring and examination of fracture test bars, such as those illustrated in Fig. 2.

The pouring of "fracture" test-bars like those illustrated provides much useful information. The diameter of these bars should be about twice the size of the largest section of casting being made, but is best determined by experiment. A series of these bars, poured, for instance, from each tap of a whiteheart cuploa melt, gives much information on the behaviour of the melting unit and fluctuations in metal composition, and actually gives warning of mottle in the castings. Several foundries make routine use of this control test, the aim being to obtain fractures having just a trace of mottle at the centre. This means that the metal is neither too "hard" nor too "soft." With a completely white fracture it is advisable to confirm that silicon is not too low or the sulphur too high. An obvious condition in the pouring of these fracture test bars is that they should be cast in the same sand that is being used for the castings. If it is possible to correlate the fracture test with chemical analysis, then so much the better, but this test is most valuable to foundries not possessing these facilities.

Annealing Furnaces

A thoroughly efficient annealing furnace is one which, among other things, can maintain uniform temperature throughout its load. The annealing furnaces used in the manufacture of malleable iron have in the past fallen appreciably short of this requirement. With coal as the fuel to provide the heat, the basic design of malleable annealing furnace has been similar to that shown in the left-hand part of Fig. 3. With pulverised coal as fuel, the furnace shown in the right-hand part of Fig. 3 was developed. This was an improvement, but the temperature distribution was still not completely uniform. With reference to Fig. 3, the annealing pots marked with shading of type A are those which are situated in the "hotter" part of the

Total Carbon, per cent.,	3.37	3.19	3.37	3.27
Silicon, per cent.,	0.86	0.84	0.89	0.86



Total Carbon, per cent.,	3.22	3.27	3.15
Silicon, per cent..	0.76	0.69	0.69

FIG. 2.—FRACTURE TEST-BARS, 2.25-IN. DIA., CAST DURING THE COURSE OF A CUPOLA MELT. THE AMOUNT OF MOTTLE IS RELATED TO THE TOTAL CARBON AND SILICON CONTENTS, WHICH ARE PRINTED ADJACENT TO THE RESPECTIVE BARS.

annealing furnace, *i.e.*, they are the first to reach the annealing temperature during the heating-up of the furnace load, and are probably maintained at a temperature well above the average temperature prevailing in the furnace during the holding or soaking period. Those pots marked with shading of type B are those which are situated in the "cooler" parts of the annealing furnace, *i.e.*, they are probably the last to reach the annealing temperature during the heating-up of the furnace load, and many not even reach the average furnace temperature. The hot and cold zones in an annealing furnace must obviously vary with design and methods of operating. Some furnaces of the type illustrated in Fig. 3, and particularly those fired by pulverised fuel, are being operated efficiently to give a reasonably uniform temperature throughout the furnace load, but with inefficient operation, even with well-designed furnaces, the temperature differences illustrated in Fig. 3 may arise. These furnaces, with the possible inclusion of the continuous tunnel type, have for many years now been the main furnace equipment in which malleable iron, annealed by the pack annealing process, has been manufactured. The fact that the castings are packed in some sort of packing material and contained in heavy iron boxes also adds to temperature differences and thermal lag. The cause and extent of thermal lag in malleable iron annealing has been admirably dealt with in a Paper by Peace.[1]

The existence of these temperature differences in annealing furnaces has made it necessary, or at any rate advisable, to locate the thinner-section castings in the cooler parts of the furnace and to have the thickest castings, which require more heat-treatment, in the hotter parts of the furnace. Unfortunately, it often happens that thick-section castings are annealed in the cooler zones, and these castings are subsequently found to require a second anneal. Furthermore, there are still many annealing furnaces in use which are not equipped with temperature-indicating or recording apparatus. These furnaces are controlled by furnacemen who, in many cases, are skilled at judging temperature, but annealing furnace temperatures must flucutuate considerably in their absence.

The installation of a simple thermocouple and temperature-recording instrument very quickly repays its cost and enables the annealer really "to get to know" his furnace. A little research carried out by siting an additional thermocouple in different parts of the annealing furnace soon gives a reliable picture of temperature differences existing within the furnace during annealing. It is always advisable to place the hot junction of the thermocouple actually inside an annealing pot whenever possible. Although there is more to be said about annealing furnaces, two items concerned with pack annealing can be dealt with conveniently here.

Annealing Pots

Many manufacturers make their own pots, using their standard iron. These pots survive between 3 and 12 heats, depending on annealing cycle and annealing furnace conditions. A general average for most plants is about 8 heats. Some manufacturers have used cast-steel annealing boxes with varied success. Research on the possibility of developing an improved yet cheap annealing box iron has not been very fruitful. A 30 per cent. chromium cast iron has been used successfully, but, of course, it is expensive. Protective coatings on the boxes have been tried with varied success. On the whole it seems that the standard iron annealing box is still the cheapest and best for, at any rate, the smaller foundry.

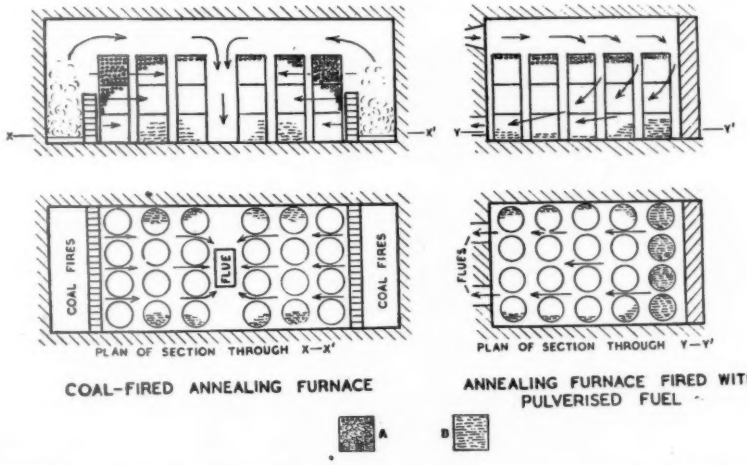


FIG. 3.—SIMPLE DIAGRAMMATIC REPRESENTATION OF THE HEAT DISTRIBUTION POSSIBLE IN COAL-FIRED AND PULVERISED-FUEL-FIRED ANNEALING FURNACES.

Packing Material

The packing materials used for blackheart annealing, which include sand, crushed slag, spent annealing ore, etc., are required to protect the castings from decarburisation and must not be capable of generating a decarburising atmosphere. The less permeable to gas these materials are, then the better is the protection they provide. It appears that when excessive oxidation of blackheart castings does occur as a result of inefficient packing protection, then pearlite rim troubles, and hence machining troubles, are enhanced.

When a blackheart iron is annealed in an artificially inert atmosphere then no rim occurs, as illustrated in Fig. 4. In the commercial annealing of blackheart under conditions which give adequate protection against the furnace atmosphere, a slight rim occurs near the edge, as shown in Fig. 5. When the packing material

[1] Peace (A. E.). "Thermal Lag in Heat-treatment Operation, with Particular Reference to the Annealing of Malleable Cast Iron." FOUNDRY TRADE JOURNAL, 1945, v. 76, May 24, pp. 67-72.

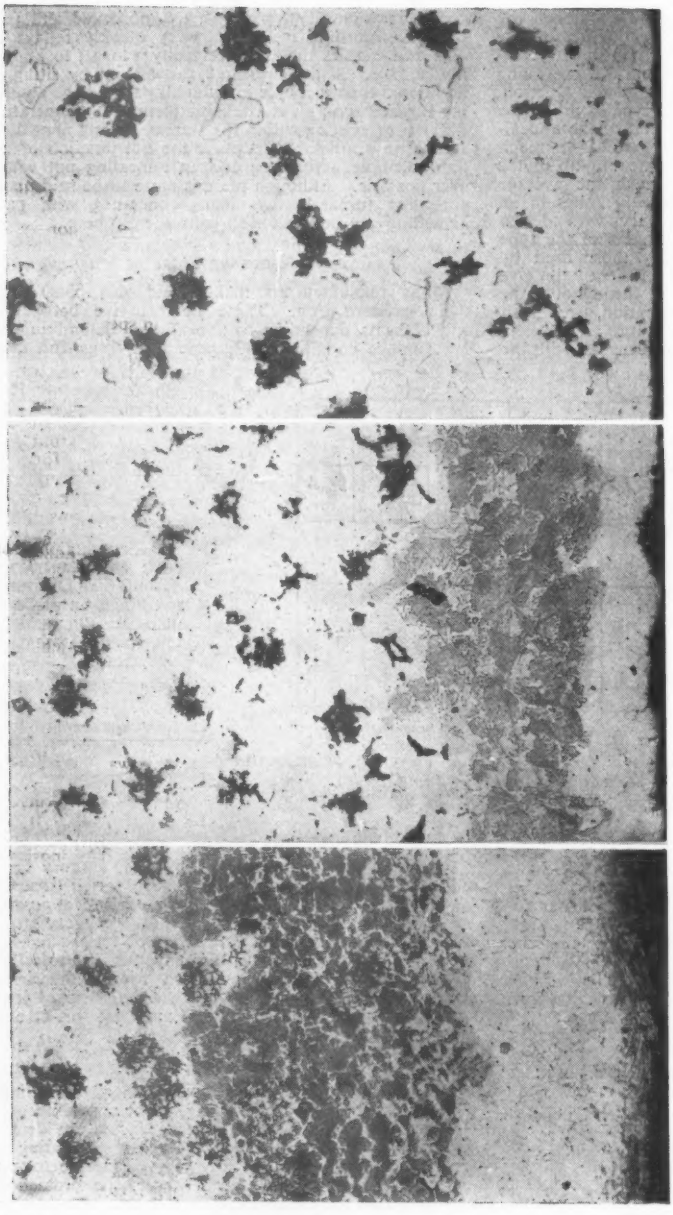


FIG. 4.—BLACKHEART IRON ANNEALED IN AN ARTIFICIALLY-INERT ATMOSPHERE. ETCHED × 60.

FIG. 5.—BLACKHEART IRON ANNEALED IN NORMAL PROTECTIVE PACKING MATERIAL. ETCHED, × 60.

FIG. 6.—BLACKHEART IRON ANNEALED IN DECARBURISING ATMOSPHERE WITH INADEQUATE PACKING PROTECTION. ETCHED, × 60.

is inadequate, such as crushed slag of too large a kibble, or in the cast of castings packed near the top of a pot, the amount of pearlite rim increases. The pearlite zone is pushed in away from the surface and a ferritic decarburised belt occurs at the extreme edge. This type of pearlite rim is illustrated in Fig. 6. Blackheart metal treated with a deoxidising addition of aluminium (0.04 per cent.) seems less susceptible to pearlite rim. It goes without saying that efficient luting of the annealing boxes is most important. Blackheart malleable iron owes much of its success to its high machining speeds, and pearlite rim must therefore be reduced to a minimum.

Most whiteheart manufacturers have experienced at one time or another the trouble shown in Fig. 7. In the ore annealing of whiteheart, the castings to be

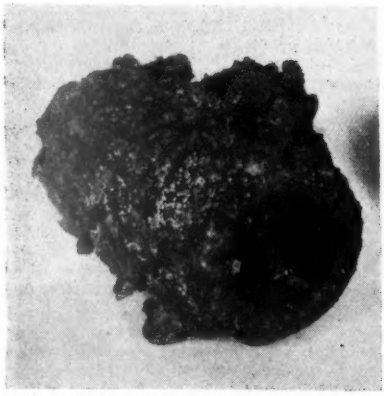


FIG. 7.—SERIOUS ADHESION OF ANNEALING ORE ON WHITEHEART CASTING.

annealed are surrounded by a hematite ore containing the required amount of oxygen to remove the unwanted carbon content. The thicker the casting, the more carbon there is to be removed, and the stronger needs to be the ore mixture, *i.e.*, the greater the ratio of new to old ore. Annealing ores, depending on their origin, usually contain about 80 per cent. of Fe_2O_3 with the remainder being mainly SiO_2. When they are contaminated with limestone in amounts of 4 per cent. or more and with fluorspar, CaF_2, the trouble illustrated here can occur. On examining a casting such as this it seems that the ore is fluxed on to the surface of the casting by a slag, and in some cases even welded on. Nothing will remove it and the casting lands on the scrap heap. What can be done to prevent its re-occurrence?

(1) Obviously the new and spent ore must be analysed chemically to determine lime, fluorspar and silica contents. When the silica content exceeds 10 per cent. then the total lime and fluoride content should be below 4 per cent.

(2) Ore in which serious adhesion has occurred should be rejected. A routine efficient separation of fines from spent annealing ore should be rigidly maintained. In this way some of the unwanted silicon and lime content is eliminated and a build-up of these constituents in the ore mixture avoided.

(3) Annealing temperatures should be controlled and excessive temperature or local heating avoided as far as possible. For instance, the annealing cans nearest the fires of a coal-fired oven can be protected from overheating by the inclusion of a baffle wall. If this is impracticable the cleanest ore should be used in the hottest part of the oven.

This trouble is most likely to occur when the decarburising power of the ore is low, *i.e.*, in spent or almost-spent ore, but this does not necessarily mean that ore adhesion can be eliminated by increasing the ore strength.

A note on how ore adhesion occurs may be of interest. Fig. 8 illustrates a layer of slag causing adhesion of annealing ore to a poorly decarburised casting. This slag of low melting point was formed from the silica, lime and fluorspar contaminating the ore, and the iron oxide, FeO, of the spent ore. It is evident that decarburisation of the casting has been seriously impaired by the slag film. The chemical analysis of a slag which caused serious ore adhesion was found to be:—Fe, 5.60; FeO, 21.41; Fe_2O_3, 2.56; CaO, 11.05; SiO_2, 50.00; and F, 1.87 per cent. It has been suggested that the welding of lumps of spent ore on to the surface of a casting is caused by the carbon of the casting reducing the iron-oxide-rich slag to produce a deposition of free iron, this being responsible for the fusion.

Another annealing ore trouble, experienced especially during the recent war when African ore was being used, was peeling. The cause was too high a sulphur content in the annealing ore; the cure was the use of an ore with a suitably low sulphur content. The sulphur content in annealing ore can either have occurred naturally with the ore, or have been picked up from the annealing furnace atmosphere. Some manufacturers still get peeling and reference to the Symposium on Peeling[2] should be made.

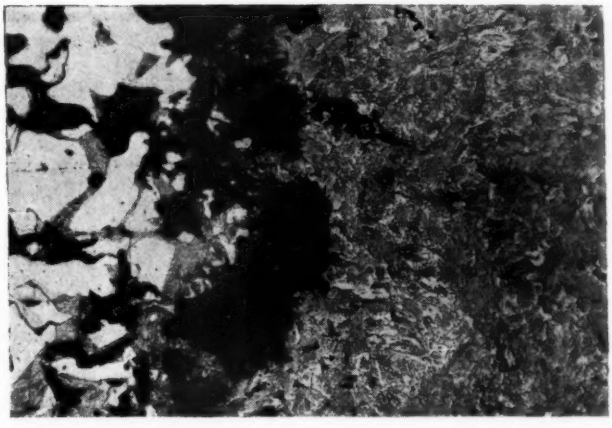


FIG. 8.—LAYER OF SLAG CAUSING ADHESION OF REDUCED ORE ON SURFACE OF A MALLEABLE CASTING. ETCHED, ×60.

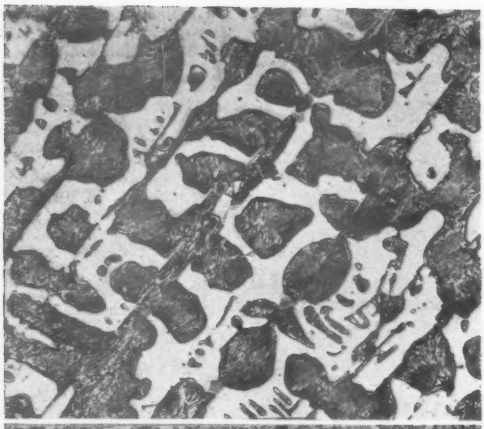


FIG. 9 (UPPER).—STRUCTURE OF WHITE IRON AS CAST. ETCHED, × 60.

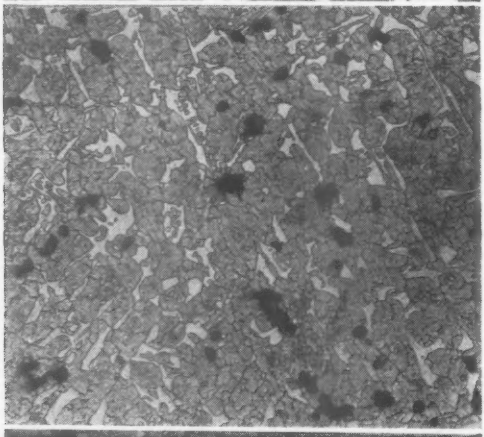


FIG. 10 (CENTRE).—PARTIAL DECOMPOSITION OF THE WHITE IRON. ETCHED, × 60.

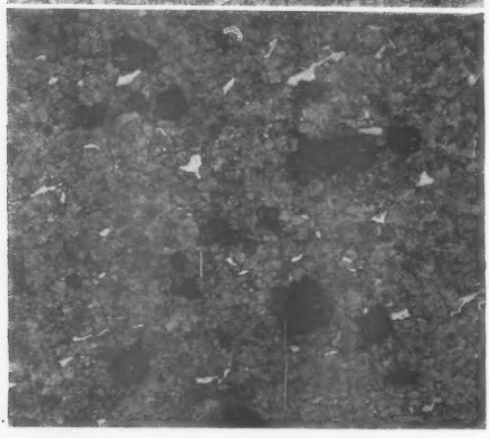


FIG. 11 (LOWER).—DECOMPOSITION OF THE EUTECTIC CEMENTITE ALMOST COMPLETE. ETCHED. × 60.

Controlled Gaseous Atmosphere Annealing Furnaces

In spite of the troubles associated with annealing ore, the pack-annealing process is used successfully to produce good-quality malleable iron. However, for those who are inclined to despair of pack annealing, there are now available electrically-heated furnaces, the annealing atmosphere within which is artificially controlled. The castings to be annealed require no packing material to protect them, and they are stacked in tiers in such a way as to enable a reasonable circulation of the furnace atmosphere around them. This new type of furnace, already well described in the literature, represents a considerable stride forward in the annealing of malleable iron in this country and it has excited much interest. Its use means no more packing material, no more annealing pots and the attainment of shorter annealing cycles. By reason of the electrical heating, a more uniform temperature distribution is obtained. Although the experience with this new equipment has so far been limited to the gaseous decarburisation of whiteheart, similar annealing equipments will soon be adopted for blackheart also, in a way that has already happened in North America.

Annealing Cycles

In discussing the annealing cycles used for manufacturing malleable iron, it is usual to refer to the first part of the heat-treatment, concerned with the breakdown of eutectic cementite, as the first-stage anneal. This is the higher-temperature anneal. That part concerned with cooling, after completion of the first stage anneal, is referred to as the second-stage anneal.

With the white-iron castings either packed in annealing pots, or stacked and arranged in tiers, their temperature is raised to the necessary first stage annealing temperature. The rate at which the castings are heated to this annealing temperature is known to have an effect on annealability, but this will be considered at a later stage. The microstructure of white cast iron is illustrated in Fig. 9. The white constituent, which is iron carbide or eutectic cementite, is hard and brittle and forms a honeycomb network throughout the structure of the white iron. It is responsible for the

brittleness of white iron. The initial purpose of a malleable anneal is to decompose this white constituent, and either to remove much of its carbon from the castings by decarburisation as in the whiteheart process, or to change its carbon content into graphite as in the blackheart process. The other constituent shown as pearlite in Fig. 9 is transformed *in situ* to austenite at temperatures above 800 deg. C. Thus the structure at the beginning of a first-stage anneal consists of austenite and cementite, and at the end of the first-stage anneal the amount of graphite depending upon the original total carbon content, and upon the amount of decarburisation or graphitisation that had taken place. In a consideration of the decomposition of eutectic cementite by first-stage annealing, the following points should be borne in mind.

(1) The higher the original total carbon content of the white iron, the more eutectic cementite there is in its structure to be decomposed.

(2) The higher the annealing temperature, the more rapidly does this cementite decompose, either by graphitisation or as a result of decarburisation. The practical upper limit for whiteheart annealing is 1,050 deg. C., and for blackheart is of the order of 930 deg. C.

(3) The higher the silicon content of the iron, the more rapidly does it decompose, particularly by graphitisation. For instance, while a 0.4 per cent. silicon iron would take at least 60 hours at 930 deg. C. to decompose completely its eutectic cementite, a 0.7 per cent. silicon iron would take not more than half that time at the same temperature.

(4) The higher the excess sulphur content, the more slowly does the eutectic cementite decompose.

(5) Manganese, in the amounts in which this element normally occurs in malleable iron, has only a mild slowing-down effect on cementite decomposition compared with that of sulphur.

It is believed that, at the centre of whiteheart sections unaffected by decarburisation, and in blackheart castings, the decomposition of this cementite begins by centres of graphitisation being set up at the interface between the austenite and the cementite. These centres can be regarded as bases for attack upon the cementite, and the more there are of them the more rapidly does the cementite decompose. Once decomposition is under way, the number of temper-carbon nodules does not increase very much, but the amount of cementite continues to decrease and the nodules to increase in size. Partial decomposition is illustrated in Fig. 10, and decomposition approaching completion is illustrated in Fig. 11.

In thin-section whiteheart castings, the formation of temper-carbon nodules is of little importance, as decarburisation predominates from early on during an anneal. The rate of decarburisation is dependent upon the speed at which carbon can move or diffuse to the surface of a casting. That speed of diffusion is primarily controlled by the temperature. The higher the temperature the more rapidly can the carbon diffuse to the edge, and be removed by reaction with the decarburising atmosphere which is generated either by the annealing ore or artificially as in the gaseous process. As far as we know to date, none of the normal elements of composition in malleable iron is capable of slowing down or speeding up this rate of diffusion to any noticeable extent, although high sulphur contents are regarded with suspicion. It is largely a matter of making sure that the annealing atmosphere is sufficiently decarburising to cope with all the carbon arriving at the surfaces of a casting. It is understandable, however, that in large whiteheart sections and in blackheart iron where removal of cementite by graphitisation is important, attention has been paid to any factor which may influence the number of nodules formed.

Rate of Heating

The introduction of the new electrically-heated controlled-atmosphere furnace capable of a rapid rate of heating to the annealing temperature, has led to

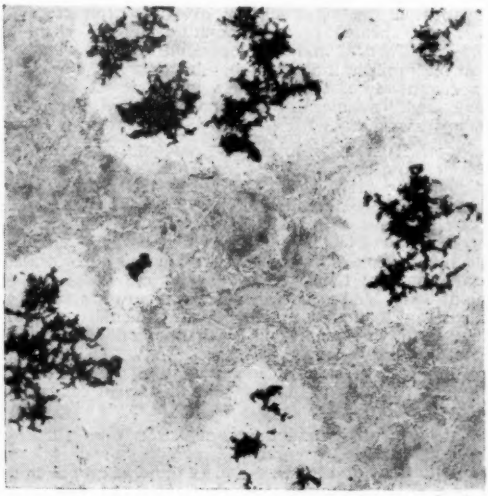


FIG. 12.—BLACKHEART IRON HEATED TO ANNEALING TEMPERATURE IN 6 HRS. ETCHED, × 60.

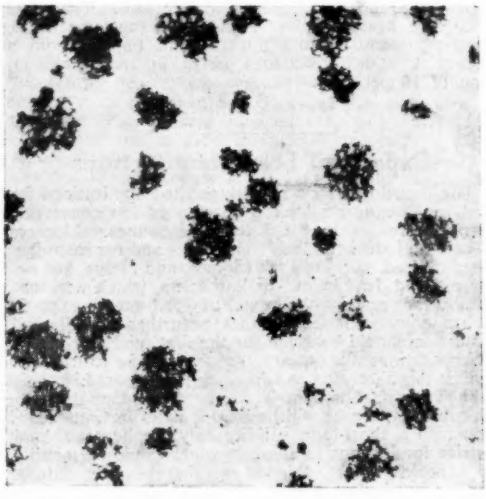


FIG. 13.—SAME BLACKHEART IRON AS IN FIG. 12, BUT HEATED TO ANNEALING TEMPERATURE IN 45 HRS. ETCHED, × 60.

Improvement of Malleable

an investigation of any influence that heating rate may have. It has recently been shown that when rapid heating rates such as those used in the new furnace, *i.e.*, 6 to 12 hours from room temperature up to 1,050 deg. C., are employed, the temper carbon nodules formed are small in number and they are larger in size, whereas as a result of the slow rate of heating in the pack-annealing process, *i.e.*, 36 to 48 hours up to 1,000 deg. C., many small nodules are formed during subsequent annealing. Furthermore, it is apparent that if a charge of white iron castings is rapidly heated to a temperature of the order of 400 deg. C., held at this temperature for a few hours and the rapid heating then continued up to the annealing temperature, the result is to obtain at least as many small nodules as would have resulted from prolonged slow heating.

Apart from the influence on rate of cementite decomposition, does the number of nodules in malleable iron matter very much? There is reason to believe that in whiteheart it is not very important and the mechanical properties are little affected. As the rapid heating rates in the controlled-atmosphere furnace are being applied at the present time only to whiteheart castings, then everything appears to be satisfactory. When a similar type of annealing furnace is put into service in the annealing of blackheart iron, however, it does appear likely that a modified heating procedure may prove to be desirable. The reason for this is concerned more with second-stage graphitisation rather than with first-stage cementite decomposition.

The larger the number of nodules in the structure during the second-stage anneal, the more readily does graphitisation proceed to give a completely ferritic matrix. When the nodules are large, and few and far between, complete second-stage graphitisation is more difficult to obtain. A rapid heat to the annealing temperature led to the microstructure illustrated in Fig. 12, with a tensile strength of 23.9 tons per sq. in. and an elongation of 6 per cent. The same base iron heated slowly to the annealing temperature gave the microstructure illustrated in Fig. 13, with a tensile strength of 24.5 tons per sq. in. and an elongation of 10 per cent.

(*To be concluded.*)

Exports of Lead Manufactures

The Board of Trade recently invited applications for licences to export a limited quantity of low-conversion manufactures of lead and lead compounds. Licences have been issued for lead compounds and for manufactures of lead, such as sheets, pipes, and alloys, but not for pig-lead, lead ingots, or lead scrap, which were not within the permissible range of lead metal exports. It has now been decided that a further very limited allocation should be made for the first quarter of 1950.

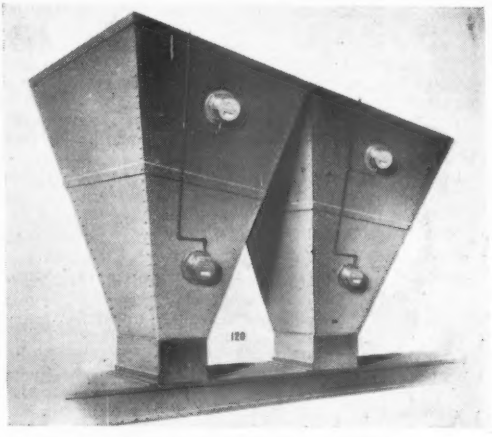
Applications for export licences to be considered against this allocation should reach the Export Licensing Branch of the Board of Trade not later than January 28. As the licences will be issued, as in previous quarters, with a short-term validity only, applicants should restrict applications to amounts which could reasonably be expected to be shipped within the near future. Further particulars of the arrangements under which this allocation will be dealt with can be obtained from the Board of Trade, Export Licensing Branch, Regis House, 43-46, King William Street, London, E.C.4.

Bin Level Indicator

Of interest to the foundry and vitreous-enamelling industries as a means of control and of avoiding hammer dents in hoppers for sand or chemicals is a bin level indicator illustrated below. It is manufactured by the Magnetic Equipment Company of 78, Highbury Grove, Cosham, Portsmouth, and is designated the "Meco." This indicator consists of a control switching system operated by pressure on a diaphragm, when the material level reaches the diaphragm the latter is deflected and operates the switches. When the material level falls the diaphragm returns to its normal position and the switches also return. Practically any type of indication can be arranged by choice of the switch.

The standard switch fitted is a single-pole change-over type rated at 5 amps. 250 volts and 3 amps. 440 volts A.C. All contacts are sealed in and are capable of millions of operations without any attention or replacement. The external leads enter through conduit to an internal terminal board.

Signalling can be arranged in different ways to suit the site requirements. A self-contained indicator lamp can be mounted in the casing if visible from the ground, when mounted high up and unseen from the control position a separate lamp unit can be fitted at a suitable level. Installations employing a number of hoppers



"MECO" BIN LEVEL INDICATOR.

usually require a central lamp-indicating station and for this purpose a separate panel fitted with flush lamps is provided. The general scheme of the hoppers being engraved on the panel with the lamps in the relative positions occupied by the bin indicators.

Visual signals are frequently insufficient to give adequate warning amongst machinery and in such cases an audible alarm of the operation of the indicator can be given; this can be isolated to a single bin of a battery without affecting the others. The indicator forms an essential feature for automatic control of feeding devices, such as screw conveyors, conveyors and elevators discharging into hoppers or bins.

A PARTY OF 200 employees of Matthew Swain, Limited, Manchester, held their Christmas party at Belle Vue on December 30, 1949. At the conclusion of tea, Mr. Matthew E. Swain, the chairman of the company, addressed the workers, and the rest of the evening was enjoyed at the circus.

A Modern Foundry Equipment Works

Rapidly-growing Factory at Leighton Buzzard

Following our declared programme of visiting the major foundry-equipment plants in this country, our representative recently journeyed to Leighton Buzzard to the Linslade works of Foundry Equipment, Limited.

FIG. 1.—EXTERIOR VIEW OF THE WORKS OF FOUNDRY EQUIPMENT, LIMITED.

When the works were first established in 1935, manufacturing was undertaken in an existing workshop of 18,410 sq. ft., the staff was comprised of five men, and the equipment was a forge, a few bars of high-tensile steel, a few sledge hammers, and an oxy-acetylene welding plant. The first order was for moulding boxes for a London foundry. To-day, after an interval of 15 years, the shops, some of which are shown in Fig. 1, house up-to-date precision machines and cover an area of 92,220 sq. ft., while there is a staff of over 300. Quite a few executives are resident overseas. There is still plenty of land—about 3 acres—available for extensions, and this has every appearance of being rapidly brought into use, providing, of course, building licences can be obtained, as the programme in hand is sufficient to keep the works fully employed for two years.

FIG. 2.—NEW OFFICE BLOCK AT LINSLADE WORKS.

Offices

Recently, new offices (shown in Fig. 2) have been built to house the general administration, sales, drawing office (Fig. 3) and blue-print making. Separate buildings house a modern canteen, caretaker's flat, billiard room, garages and cycle sheds. Transport is provided for the convenience of men living in nearby town and villages. A system of family allowances has been in existence for some years, and is highly appreciated by the operatives.

Structural-steel Shop

In the construction of foundry plant, there is required much plate work for hoppers, bins, moulding boxes, elevator components, and so forth. For its manufacture, a modern shop, shown in Fig. 4, has been recently created and equipped. The main bay is spanned by 5-ton cranes and there is ample space for the guillotines, shears, bending machines, and the welding booths where both electrical and oxy-acetylene methods are used. The lighting, both artificial and natural, is excellent; heating is effected by hot-air units placed high along the walls and elsewhere.

Machine Shop

Shown in Fig. 5, the machine shop is generously equipped, but there is still a mixture of a few old

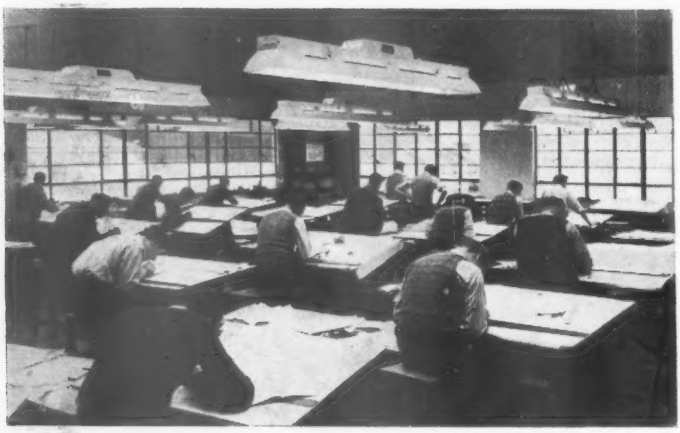


FIG. 3.—SPACIOUS AND WELL-LIT DRAWING OFFICE.

with the very latest heavy-duty machine tools and so forth. Yet, some of the former, such as a pair of band saws or a large surfacing lathe of Continental origin, could hardly be improved on to-day. However, the policy of the firm is to re-equip wherever labour-saving and quicker results can be shown. Good internal transport facilities have been provided and comfortable working conditions have been assured.

Foundry

For a manufacturing establishment of this size, a foundry is essential. The tradition that foundry-equipment concerns should buy their castings is out-moded. It is necessary, under modern conditions, for firms wherever possible to take their own medicine, that is, to try out new types of foundry machines under foundry conditions. In Fig. 6, for example, there is shown a "Minor" sand rammer, an adaptation of a heavier model of which a large number of industrial installations has been made. A feature of this machine is the construction of the impeller head, the blades of which are made of steel. They give a definite vertical throw and the arrangement is such that the machine can work quite satisfactorily with the casing door open. The light-section blades are designed to give an exceptionally long life. The foundry, like most in this country, is not as high as is called for under modern conditions, but apart from that it is well lit, adequately heated and for the major part has a concrete floor. There are two sand plants, one continuous and one a batch-type. The former includes in its make-up a continuous mill of the central-discharge type, a rotary screen, magnetic separator, and an aerator interconnected by belt and bucket elevators; there is a storage hopper with a rotary table and plough discharge and, finally, a conveyor to supply the overhead hoppers. As would be expected, all the plant, including the various conveyors, steel box-parts, etc., is made in the home factory. Much use is always made of the experimental department of this company and, through the services of chemical, physical and sand laboratories, control is established and variations of all types are recorded and used for design and development purposes.

FIG. 4.—FABRICATING SHOP FOR STRUCTURAL STEEL.

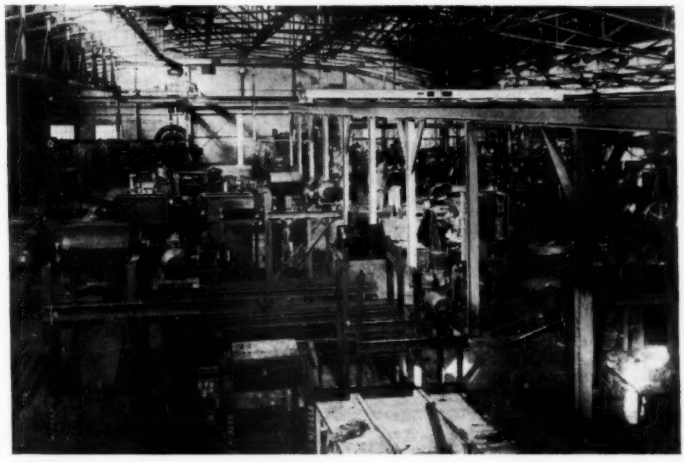


FIG. 5.—GENERAL VIEW OF THE MACHINE SHOP; SOME PART-ASSEMBLED PLANT IS SHOWN IN THE FOREGROUND.

In conclusion, our representative acknowledges with sincere appreciation the welcome accorded to him at Leighton Buzzard by Mr. A. S. Beech, M.I.Mech.E., the managing director, and his colleagues, and expresses his thanks for the privilege of inspecting a plant which has made, and is making, such a worth-while contribution to the modernising of the founding industry at home and abroad.

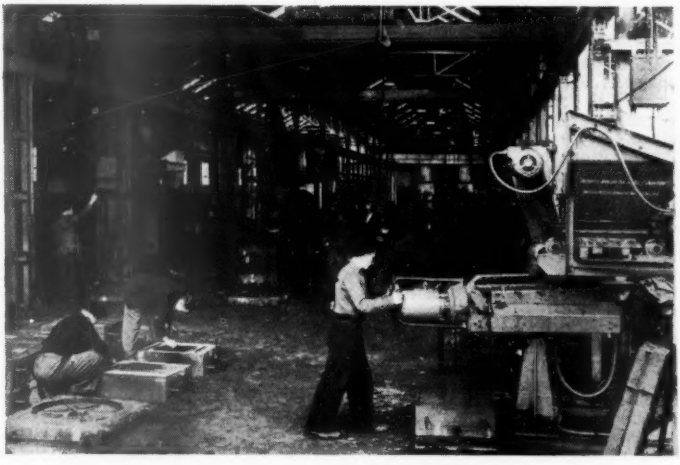


FIG. 6.—VIEW OF THE FOUNDRY, SHOWING A "MINOR" SAND RAMMER IN USE.

F.B.I. Opens Canadian Office

The Federation of British Industries has opened an office in Toronto in order to extend the scope of its representation in Canada. The office is intended to give first-class advice and help to member firms and to provide information to Canadians about United Kingdom goods and supplies. It will also give industrial groups or trade associations office accommodation for their representatives in Canada. Because of the importance of increasing British exports to Canada, the F.B.I. has decided that these facilities shall not be restricted to direct members of the Federation, as would be the usual practice.

Sir Norman Kipping, director-general, has stated that the Federation has decided to devote 10 per cent. of its income to its organisation in the dollar markets. (The published income in 1949 was £200,000.)

Barrow Hematite Excluded from Steel Act

The Minister of Supply, Mr. G. R. Strauss, has sent formal confirmation to the Barrow Hematite Steel Company, Limited, that it will be excluded from nationalisation. The company is named in the Third Schedule of the Bill for nationalisation, and the Minister has had to make use of the special provisions in section 21 of the Act, which allow him to exclude companies, on certain conditions.

Pattern Equipment for Production Moulding

Discussion of Mr. S. A. Horton's Paper

When the Paper, "Pattern Equipment for Production Moulding" (printed in last week's issue) was discussed at a meeting of the Lancashire branch of the Institute of British Foundrymen, the questions were confined almost exclusively to core making and, more particularly, core blowing. It was clear that Mr. Horton's disclosures had aroused considerable interest, and many details were enlarged upon during the discussion, an abridged version of which is now published.

MR. TAYLOR enquired as to how much Mr. Horton varied the mixture of his sands. Was there any condensation in the sand from the air supply? With small cores there had been found to be great difficulty with the vertical-type of machine. Any water that got into the mixture tended to have some effect.

MR. HORTON said a typical core-sand mixture was 336 lb. Silica sand (Congleton), 5½ lb. core cream, milled in a batch-type mixer for 4 mins.; slight variation in the quantity of cream influenced the flowability. No trouble was experienced from condensation in the air supply. Adjacent to each pair of core-blowing machines was a 9 cub. ft. receiver, and as one pair of machines were at the extreme end of the pipeline from the compressor, a 90 cub. ft. receiver was placed close to these machines to maintain as constant a pressure as possible. The moisture in the pipelines was drained off each morning before blowing commenced.

MR. HARDY asked what was the average thickness for the core carriers, and of what material did they make the patterns for these.

MR. HORTON replied that the sectional thickness varied with the design; a core carrier heavily ribbed was usually $\frac{3}{16}$ in. thick and one without ribs ¼ in. The usual practice was to cast a plaster core box from either the master or working core box and then dress the plaster down to the required thickness.

MR. FARRINGDON asked what was the smallest number of cores Mr. Horton would make with core blowers. Was it ever a case of one or two off?

MR. HORTON said the making of a core box suitable for core blowing would not be considered unless the requirements were over 1,000 cores; he believed it was possible to blow a core quite satisfactorily in a wooden core box and, with suitable equipment, there was no reason why quantities of 100 could not be considered.

MR. FARRINGDON noticed that the margin on the joints had been mentioned as 1½ in. wide.

MR. HORTON recommended as wide a marginal face around the core cavity as practicable. With a narrow margin there was always the difficulty of maintaining a perfect seal and once the air commenced to escape through the parting, the erosion by the sand could not be checked.

MR. CROPPER said there appeared to be advantages with aluminium core boxes, but was there any oxidation during the time when a core box was not in use?

MR. HORTON said oxidation never gave trouble, because if the core box were not in continuous production it was stored in a suitably-heated pattern store. He suggested that wiping the core cavity with a paraffin rag might assist in preventing the core from sticking to the core box.

MR. BOYES asked about the quantity produced. Considering 180 were made per hour, it seemed to him, from the photographs, that the vents were rather large. Was there any trouble with vents becoming blocked with sand? Was there a maximum diameter of vents in a core box to prevent any blocking with sand?

MR. HORTON replied that the largest slat vent used was one 1 in. dia., but the ones referred to were ¼ in. dia. The more common sizes were ½ in. and ¼ in. dia. No trouble was experienced through the vents blocking up, as each operator used a suitably-ground hacksaw blade to keep the vent clean. Another method was to soak the core box in cold water either overnight or for three or four hours to clear the vents.

MR. SEDDON asked if cast plates had been made, and, if so, by what method? Would drags be used?

MR. HORTON said cast plates were made by a similar practice to that of producing a metal pattern, except for the introduction of the pattern plate. He indicated the method adopted by means of a diagrammatic sketch on the blackboard.

Core Carriers or Drying Shells

MR. CHIPPING enquired from what material the core carriers or drying shells were made. In the event of using a core mixture, such as with linseed oil, was there any trouble in transferring the core from the core box to the carrier?

MR. HORTON stated that the carriers for large cores were usually of aluminium. In the case of small cores, cast iron was used. Dowels were built into the core-box joint to locate the carrier on the core box, the carrier being placed over the core after half the core box was removed, rolled over and the remaining half core box then removed, leaving the complete core in the carrier. There was no trouble with linseed oil.

MR. POLLITT asked if there was any tolerance in size.

MR. HORTON said there was no movement of the carrier when in position on the core box—it was just a fit.

MR. HARVEY asked if the core box was fitted with a plaster core upon which to fit the drying shells.

MR. HORTON said it was common practice to run a plaster core into the box itself and, when dry, coat it with red lead and use it for the purpose of bedding the core carriers.

MR. HARVEY asked if there was clearance.

MR. HORTON said there was no clearance, but a slight taper for approximately one inch from the joint, to ensure there was no crush as the drier closed over the core.

Operational Details

MR. LORD asked if it was correct that production was at the rate of 180 off per hour.

MR. HORTON stated that production was at the rate of 180 per hour for the core box shown with two cores per box, and was 120 per hour for the large core.

In reply to Mr. Aitken, MR. HORTON said it was preferred to work at 100 lb. per sq. in. air pressure or over, but, as he had already explained, one set of machines was right at the far end of the works, and on occasions the pressure fell as low as 80 lb. Unfortunately, 80 lb. did not satisfactorily blow a core, and this did give trouble, and sometimes blowing had to stop. There was a pressure gauge over each machine, so the operator knew when the pressure was going down.

MR. MULLER asked what was the method of filling the machine with the sand; was the sand stationary prior to entering the blowing head?

MR. HORTON explained that over the blowing head on the top of the machine there was quite a large sand reservoir; the sand was brought to the machine by barrow, and shovelled into the reservoir. The blowing head was moved backwards and forwards and, before being brought over to the blowing position, sand was scooped by hand into the head. There was no agitator in the blowing head.

MR. NIELD enquired how the conclusion that the fine sand grains were blown to the outside of the core box was arrived at.

MR. HORTON said it was not entirely his personal opinion; he was assured that similar cores prepared from similar sand mixtures, first by normal core-making practice, and secondly by blowing, when examined showed a finer surface finish for the blown core than the rammed core, and the permeability of the blown core was also the greater.

MR. GASKELL asked if the blown cores were dried on a normal core-drying stove.

MR. HORTON replied that they were, along with the ordinary production from the core shop.

Radio-frequency Core Drying

MR. GASKELL then asked if there were any radio-frequency stoves used; he understood they were used in America.

THE PRESIDENT (MR. HANDLEY) said that probably Mr. Gaskell was thinking of the drying of cores by high-frequency currents. Without going into a long discussion on the technicalities of the matter, it was possible to liken the core to be dried with the insulating medium of an electrical condenser. If a high-frequency current was applied across the two plates of the condenser, then there was heating of the intervening medium. In ordinary language, this was roughly what happened. What Mr. Gaskell had heard was not really peculiar to America, because the method was being used fairly extensively in this country. To his knowledge, a number of foundries, his own included, used high-frequency core-drying apparatus. Perhaps the Americans had gone further than we had in this country in that, at the Exhibition in Philadelphia last year, there had been a continuous drying stove working on this principle. The cores were fed in from one end on a moving belt, and within two or three minutes they came out at the other end thoroughly cured. A phenomenon of this method of drying was that it took place uniformly throughout the mass of the core. There was no skin drying, such as sometimes occurred with the generally-accepted core-drying practice.

MR. CHIPPING asked if the President had noticed of what material the belt was made.

THE PRESIDENT said it was a type of rubber belt. The electrodes of the drier were placed above and below it; there was capacitance between them, and the cores were dried as they passed between.

MR. CHIPPING asked if the belt was an insulator.

THE PRESIDENT answered it would not have to be an insulator in the case of high-frequency drying, as the core would have to have a much higher dialectric constant than the belt. It might be said that the sand it was proposed to heat up formed the insulator.

MR. CHIPPING said that synthetic rubber was largely a conductor.

MR. MITCHELL mentioned that he had visited a works where he had been shown radio-frequency sets working. As a demonstration, a piece of hard wood, just a little bigger than a matchbox, was placed in the set. It was in for a few minutes, and then, through a window, it could be seen to start smoking. When taken out, it was found that it had started burning from the centre.

Blowing a Boot-shaped Core

MR. FOX asked Mr. Horton if he would attempt to blow a core, the shape of a wellington boot.

MR. HORTON did not see any reason why this shape should not be blown; he suggested the best method would be to have the boot laid horizontally.

MR. FOX asked if Mr. Horton would blow this core from the side.

MR. HORTON thought he would design the core box with the toe downwards, so as to get a blowing hole over the toe and fill the core box progressively to the heel. As far as he was aware, there was no core which could not be blown, though some time would undoubtedly be required in order to develop the correct practice for individual shapes.

MR. GALE said he would blow the "boot" core with a horizontally-split box, or one single nozzle, right from the top of the leg of the boot. Provided there were plenty of vents, it would blow quite easily.

MR. CROPPER said it had been stated that it was always better to over-vent rather than to under-vent. His own experience was that with too many vents, the core could not be blown satisfactorily.

MR. HORTON said the point he wished to emphasise was that, to maintain a perfect seal as long as possible, it was better to over-vent the core box adjacent to the joint than to under-vent it, the latter resulted in the failure of the core-box joint. When he referred to over-venting, he meant within limits, because sufficient knowledge had been acquired after a fairly wide experience that, invariably, a new core box could now be slat vented in the pattern shop and a reasonably satisfactory core could be produced from the first blow.

Darwins' Position : Capital Intact

At a meeting of Darwins, Limited, steelmakers, of Sheffield, on December 29, resolutions were passed that Dr. N. D. Chopra, former chairman of the company, and Mr. W. J. Wigney, former managing director, should not be re-elected to the board. Mr. F. Thompson-Schwab, acting chairman, stated, however, that the directors already had sufficient data to give an assurance that the capital of the company was intact.

He added: "I must make it clear that even at the adjourned meeting it may not be possible for me to comment as fully as I should like to have done on certain matters relating to the conduct of the company's business during the year under review, since your board have been compelled to take legal advice on these matters, and they may be *sub judice*."

Thermal Properties and Chilling Power of Some Non-metallic Moulding Materials

By R. W. Ruddle, M.A., and A. L. Mincher, B.Sc.

From a communication by Mr. R. W. Ruddle, M.A., and Mr. A. L. Mincher, B.Sc., of the British Non-ferrous Metals Research Association to the Institute of Metals on the subject of thermal properties and chilling power of some non-metallic moulding materials, the following abstracts have been taken:—

The earlier sections of the Paper are devoted to a brief mathematical treatment of the flow of heat in moulds of low thermal conductivity and to a review of existing information relevant to the subject.

The experimental work, described in the main part of the paper, was carried out with the dual objects of (*a*) testing the validity of the mathematical treatment, and (*b*) determining the chilling powers of the materials examined. Cylinders, 5 in. dia. by 10 in. long, were cast in moulds made in each of the following materials: synthetic sand (green and dry), naturally-bonded sand (green and dry), bonded magnesite, bonded silicon carbide, and plaster. The casting was made in different alloys to examine the influence of freezing temperature on the heat flow in the different moulds. During the solidification of the castings, heating curves were taken at various points in the moulds and the temperature distributions thus obtained experimentally were compared graphically with those predicted by mathematical analysis. The apparent thermal conductivities of some of the mould materials studied in this work have been calculated. These calculations have been made for two temperatures—500 and 1,000 deg. C.—and the results are given in Table I together with the figures obtained from the experimental data by calculation. The constants used in making the calculations are listed in Table II. In studying the figures it must be remembered that those calculated are values of the apparent conductivity at the particular temperature; the experimental figures, on the other hand, are mean figures. Good agreement was found with most of the dried moulds. The mathematical treatment could not be applied to the green-sand mould, but the rate of heat extraction by these moulds was found directly from the experimental temperature-distribution curves. The rate at which all the moulds removed heat from the casting was found to be greatest when metals of high freezing temperature were cast; this is due primarily to the steeper temperature gradient in the mould, but is also in part caused by intergranular radiation which increases the apparent thermal conductivity of the mould at high temperatures.

TABLE I.—*Experimental and Cuculated Conductivities for Various Mould Materials.*

Mould material.	Thermal conductivity calculated from Russell's equations in c.g.s. units.		Mean conductivity found experimentally, in c.g.s. units.	
	500 deg. C.	1,000 deg. C.	Room temperature to 548 deg. C.	Room temperature to 1,083 deg. C.
Synthetic sand ..	0.0009	0.0016	0.0010	0.0017
Mansfield sand ..	0.0008	0.0010	0.0010	0.0014
Bonded magnesite ..	0.0008	0.0012	0.0049	0.0027
Bonded silicon carbide	0.0009	0.0020	0.0016	0.0028

The thermal conductivity of air was taken to be 0.000129 c.g.s. units at 500 deg. C. and 0.000182 c.g.s. units at 1,000 deg. C.

TABLE II.—*Constants Used for Calculation Purposes.*

Mould material.	Mean grain dia., in mm.	Thermal conductivity of pure substance, c.g.s. units.		Density of pure substance, gm. per cub. cm.
		500 deg. C.	1,000 deg. C.	
Synthetic sand ..	0.25	0.013	0.0098	2.65
Mansfield sand ..	0.11	0.013	0.0098	2.65
Bonded magnesite ..	.. 48 per cent. .. of 0.46 .. 52 per cent. .. of 0.09	0.032	0.010	3.62
Bonded silicon carbide	0.27	0.78	0.48	3.21

Approximate figures have been derived for the following thermal constants of the dry moulds: temperature diffusivity, apparent thermal conductivity, heat diffusivity, and "mould constant." Figures are also given for the "mould constants" of the green moulds. It is shown that these constants may be used to calculate the freezing times of simple castings with fair accuracy.

Conclusions

The Authors record their conclusions in the following statements:—

(1) The heating of a plane mould wall, of low or moderate chilling power, in contact with a casting, and the rate of heat extraction by the mould wall are amenable to mathematical treatment with a good degree of accuracy, provided (*a*) that the interface temperature is fairly constant, (*b*) the temperature diffusivity of the material is not greatly affected by temperature, and (*c*) the mould is free from moisture.

(2) The values for the temperature diffusivities of the various materials obtained during the course of the work are reasonably consistent with the figures obtained by other workers.

(3) The grain-size distribution of the material of a non-metallic mould is an important factor which, by influencing the porosity and the extent of intergranular radiation, greatly affects the apparent thermal conductivity and chilling power, especially at high temperatures.

(4) The chilling capacity of a green-sand mould is greater than that of dry sand at aluminium casting temperatures, but the relative difference decreases with increasing temperature reaching a low value at copper casting temperatures.

(5) Taking the chilling power of the dry, synthetic sand investigated as unity at aluminium casting temperatures, the approximate relative chilling powers given in Table III may be assigned to the materials examined. These ratings vary as the temperature of casting increases from that of aluminium to that of copper.

TABLE III.—*Relative Chilling Power of Mould Materials.*

Mould material.	Relative chilling power.	
	Aluminium casting temperatures.	Copper casting temperatures.
Bonded magnesite	$2\frac{1}{4}$	4
Bonded silicon carbide	$1\frac{1}{2}$	$3\frac{3}{4}$
Green synthetic sand	$1\frac{1}{2}$	$2\frac{3}{4}$
Green Mansfield sand	$1\frac{1}{2}$	$2\frac{1}{4}$
Dry synthetic sand	1	$2\frac{3}{4}$
Dry Mansfield sand	1	$2\frac{1}{4}$
Plaster	$\frac{3}{4}$	$1\frac{1}{2}$

(6) It is possible to calculate approximately the freezing times of castings of simple shape, from knowledge of the thermal properties of the mould material.

Scottish Light Castings Industry

Trends and Progress Reviewed

By Our Special Correspondent

There has been a silent, but nonetheless significant, revolution taking place in the light iron castings industry in Scotland since the end of the war, and in the year just ended, new concepts and new methods have made tremendous advances. With an assured market and no haunting fears of nationalisation, the industry has provided to the nation the full demonstration of the recuperative powers of unfettered free enterprise. The problems which sprang up in the aftermath of war have largely been cleared and the path ahead has been prepared.

Though it may be overstating the case to say that the past year has seen the triumph of mechanised methods of moulding, what is probably true is that many convinced adherents of manual methods have within recent times become aware that the future lies with the machine. Most foundries in the Scottish central area have adopted the new methods to some extent, and notably in the vanguard are Smith & Wellstood, Limited, who are erecting at Bonnybridge a completely-mechanised foundry which they expect to have in operation about the middle of this year.

This change of attitude towards machine moulding, which, after all, is no novelty (German machinery was in use at Burnbank in 1910), has been dictated by a variety of circumstances. The Falkirk foundry industry based its world-wide reputation on the skill of its craftsmen moulders. It might be asked what need was there to change to machines which could give neither the much-prided finish, nor the variety of goods which these men could supply? However, in common with other industries, iron founding suffered a depletion of its labour force during the war and, more serious, the normal flow of apprentice labour to the foundries was stopped. Then again, the many goods that found a ready peacetime market were simply not able to reach their markets in wartime and production of many ranges ceased.

Later on, there was a sudden rush of orders from Government sources for heating and cooking utensils and it was largely in the manufacture of a few ranges that wartime activity was maintained. In this situation short of skilled craftsmen and with a limited variety of manufacture, the obvious solution to the industry's problem was mechanisation. This was introduced in a small way in some shops, but generally it was hoped that the return to peacetime conditions would render further ventures in this direction unnecessary. In actual fact, many craftsmen failed to return to the industry and methods of recruiting new labour, despite innovations presenting more attractive conditions of employment, did not prove conspicuously successful. The trend towards mechanisation was therefore begun in earnest.

Survey of the Year's Working

There has been an expression of disappointment in the industry that, while calls have gone out for more and more exports, the light iron castings trade has not been permitted to take its rightful place in the drive and regain at least some of its pre-war prestige in the markets of the world. To overcome these difficulties, at least three Falkirk concerns have secured an interest in, or are negotiating for, foundries abroad, principally in South Africa. It is hoped by this means to serve the foreign market, which has long been unavoidably neglected.

Supply of raw materials has continued to be more or less on a ration basis and there has rarely been enough to meet the full needs of all foundries. Quality of some of the scrap which has been supplied has been something less than the best and has resulted in difficulties in maintaining the quality of castings. Again, a shortage of foundry pig-iron in Scotland has been encountered, largely due to the concentration of the blast furnaces on the output of basic pig-iron for steelworks. Solution of this problem seems to lie in the speeding-up of the building of blast furnaces for the production of pig-iron, thus lessening the dependence of foundries on scrap. It may also be possible to bring in more raw materials in the form of ore from our own overseas sources of supply such as West Africa, which have not the disadvantage of being in a hard-currency area.

Employment Prospects

From the labour point of view, conditions in the industry are probably better than they have ever been. There is no unemployment at all in the skilled sections, there is a steady flow of work, and firm prospects for the future. In addition, many firms have introduced amenities such as shower baths and changing rooms and generally improved conditions of employment. The five-day week, introduced three years ago, has generally proved satisfactory and has resulted in no loss of production, since it had long been local foundry practice to make castings on five days only.

Problems no doubt lie ahead, and difficulties peculiar to the transition from manual to machine moulding will have to be met. But with an assured market for several years to come, and with the prospects of foreign buyers again being given the freedom to choose the Falkirk-made article, the industry can face the new year with equanimity.

Thos. W. Ward Board Changes

Mr. Ashley S. Ward, who has been chairman of Thos. W. Ward, Limited, Sheffield, since 1941, has resigned from that office. He remains a director of the company and will act in an advisory capacity. In recognition of his many years' service he has been appointed president of the company.

Mr. George Wood has been appointed chairman and Mr. Frank R. Stagg deputy chairman, while Mr. H. W. Secker and Mr. J. Walton become joint managing directors. Mr. Arnold Carr, hitherto in charge of the company's London area operations, is to transfer his activities to Sheffield for other work. Mr. F. W. Robinson, a local director, has been appointed to the full board of the company and will take charge of London area interests.

Hydraulic Working Platform

A new hydraulic mobile working platform, called the "Beanstalk," has been introduced by William Moss & Sons, Limited, North Circular Road, Cricklewood, London, N.W.2. It is a working platform with a maximum height of 17 ft., which allows the operator to work at positions of 22 ft. to 23 ft. from the ground. The actual platform is 2 ft. 3 in. square and is provided with toe boards and handrails which fold down for transit and movement under arches 6 ft. 6 in. high. A manual hydraulic pump, actuated by the operator whilst standing on the platform, gives full lift in two min.; descent is effected in 45 secs.

Foundry Expansion Opposed

Nearly one million pounds worth of export machinery orders will be lost by a Sheffield firm if the Ministry of Town and Country Planning fails to over-ride the decision of the Tottington Council which refuses permission to Hargreaves & Jennings, Limited, a firm of local ironfounders, to extend their works so as materially to increase production. An appeal against the County authority's decision was made by the firm in Tottington Town Hall on December 14.

Mr. A. L. Mortimer, the Ministry's Inspector, heard evidence for and against the proposition, and statements by private individuals, and is to submit a report to the Ministry of Town and Country Planning. Mr. R. D. Brown, barrister, representing the firm, pleaded for an early decision as delays had already cost many thousands of pounds to the firms involved. Further delay would increase that loss proportionally.

Summing up the negotiations which had led up to the rejection of the firm's proposed development plans, Mr. Brown declared that it was a "very sorry tale."

In 1946, Hadfields, the Sheffield steel manufacturers, had bought another Sheffield firm, Millspaugh's, Limited, which were then making component parts for paper-making machinery. It was decided, however, that Millspaugh, Limited, should enter the export market as manufacturers of complete paper-making machines, which would weigh about 600 tons and cost around £150,000 each. The bulk of these machines was composed of iron castings and, to ensure a steady supply of castings for the proposed machines, Millspaugh, in January, 1947, acquired the foundry undertaking of Hargreaves & Jennings, Limited, at Tottington. Because of the inadequate capacity of the Tottington works to supply the ten-ton castings, it became necessary that the works should be extended to increase its output by nearly 50 per cent. The Tottington District Council was approached by the directors of the firms in May, 1947, for the purchase of additional land for the necessary extensions.

After negotiating, the Council decided to sell the firm a little more than a quarter of an acre of public land which adjoined the foundry. Permission for the sale was received from the Ministry of Health and three other government departments. This, however, took some time and the contract for the sale was eventually signed in April, 1948. The Tottington District Council were at that time the interim planning authority for the district and the firm's intentions were well known to them. On these grounds, Millspaugh, Limited, went ahead with their preparations. A very large plant was installed at their Sheffield works and more was on order for delivery in the near future. Representatives had travelled all over the world and had secured orders for half-a-million pounds worth of paper-making machinery, for which experimental delivery dates were promised. They had also submitted tenders for a further million pounds worth of orders. Nearly 80 per cent. of the business for which the firm was catering was in the export market.

The firm's preparations depended on the proposed increased production from the foundry of Hargreaves & Jennings, Limited, but when planning authority passed from the District Council authority to the County Council authority, the extension was refused. Mr. Brown complained of the time that had elapsed between making the application to the County and its refusal. Vital industrial development had been held up—not for the maximum statutory period of two months, but for nearly four months—at a time when the country was fighting its way through an economic crisis and nearly every Ministry was calling for more production and exports, he said.

Mr. Brown said that County authority's refusal was "absolutely outrageous," in view of the circumstances, and condemned the proposed plans for Tottington as "unrealistic." He pointed out that the works fell a mere 80 yards outside the boundary of the recommended industrial area.

The Clerk to the Divisional Planning Committee, who opposed the appeal on behalf of the County Authority, said that all the facts had been laid before the Committee and they had known the situation fully when they rejected the firm's application. The application was refused because the works of Hargreaves & Jennings was inside the area designated for non-industrial purposes in the industrial plan. The result of the application had been longer than normal in coming through because the planning officers had held up administration until they had personally interviewed the firm's representatives to make sure their side of the case was put fully before the Planning Committee.

Woodall-Duckham's New Chairman

Mr. F. B. Richards's Retirement

Mr. F. B. Richards, who has resigned his position as chairman and has retired from the board of the Woodall-Duckham Vertical Retort & Oven Construction Company (1920), Limited, the operating company of the Woodall-Duckham group, in accordance with the company's retirement policy, retains the chairmanship of Woodall-Duckham, Limited, the holding company of the group. Mr. Richards has been associated with the Woodall-Duckham Company since its inception and has played a leading part in its development. He became a director in 1923, then joint managing director and, finally, chairman in 1932, following the death of Sir Arthur Duckham.

Mr. Richards is a past chairman of the Council of the Society of British Gas Industries and a past member of the Council of the Institution of Gas Engineers. He has travelled extensively on behalf of the company; at present he is in Australia visiting the associated company, Woodall-Duckham (Australasia) Pty, Limited.

Mr. T. C. Finlayson, formerly deputy chairman, has been appointed chairman of the Woodall-Duckham Vertical Retort & Oven Construction Company and deputy chairman of Woodall-Duckham, Limited. He joined the research staff of the Woodall-Duckham Company in 1921 to carry out an investigation at Manchester University into methods of producing cheap oxygen for gas manufacture, which work formed the subject of the first transaction of the Institution of Chemical Engineers and for which Mr. Finlayson was awarded the M.Sc. degree. He was appointed to the London staff of the company in 1923 and for the next 18 years was a member of the design and development department, being responsible for the co-ordination of the company's design practice. He was appointed a director in 1941, technical director (in succession to Sir Ernest Smith) in 1943, and deputy chairman in 1948.

Mr. Finlayson is a member of the Council of the Institution of Gas Engineers and of the Gas Research Board. He has been associated with the work of the British Coke Research Association since its inception. He is a holder both of the Institution of Gas Engineers' Gold Medal and the H. E. Jones London medal.

Personal

MR. STANLEY J. ADAMS has resigned from the board of the Birmingham Small Arms Company, Limited.

BRIG. JAMES STORAR has been appointed vice-chairman of Vulcan Foundry, Limited, Newton-le-Willows (Lancs).

MR. L. WOODCOCK has been appointed sales manager of the industrial and marine units division of Leyland Motors, Limited.

MR. J. D. ROBINSON, works manager of the wire-works of Dorman, Long & Company, Limited, Middlesbrough, for the past 21 years, has retired.

MR. F. M. L. FITZWILLIAMS has resigned from the board of P. B. Cow & Company, Limited, aero engineers, etc., of Streatham, London, S.W.16.

MR. GRIFFITH WILLIAM ROBERTS, secretary of the Liverpool branch, has retired after 30 years with the Marine Engineers' Association, Limited. He is 66.

MR. D. R. STAINTON, Jarrow estate manager, North-Eastern Trading Estate, Limited, has been appointed sales manager with Sterling Foundries, Limited, Jarrow.

MR. T. MARTIN, outside manager of John Readhead & Sons, Limited, shipbuilders, of South Shields, has retired after more than 50 years' service with the company.

SIR AMOS L. AYRE, chairman of the Shipbuilding Conference, is to be appointed a freeman of South Shields in connection with the town's centenary celebrations this year.

MR. B. G. HEELEY, works manager and a director of Kayser, Ellison & Company, Limited, steel manufacturers, of Sheffield, retired recently after 60 years' service with the company.

MR. H. ROSEMAN, of 36, Victoria Street, London, S.W.1, has resigned from the Oakland Metal Company, Limited, and intends starting on his own account as an alloy manufacturer.

MR. F. WALKER, manager of the constructional shops of Newton, Chambers & Company, Limited, Sheffield, has been appointed works manager of Wellington Tube Works, Limited, Tipton (Staffs).

MR. DAVID L. BARRIE, a director of Thomas C. Keay, Limited, textile engineers, of Dundee, has retired after 64 years' service with the company. Mr Barrie, who is 75, was the firm's oldest employee.

MR. PHILIP SAMUEL, who recently obtained the degree of B.Met. (Founding), with first-class honours at Sheffield University, has been awarded the Foundry Prize of the Iron and Steel Institute.

MR. F. C. M. MACKEY has resigned from the board of Stirling Implements, Limited, agricultural engineers and blacksmiths, of Stirling. MR. THOMAS MARTIN has been appointed manager and sales representative of the company.

MR. FREDERICK FRANKS, managing director of the Furnival Steel Company Limited, Sheffield, is sailing on February 11 to the Argentine, where he will spend some time with the associated firm, Aceros Furnival, Ltda, Buenos Aires.

MR. P. B. HENSHAW, joint managing director of Kayser, Ellison & Company, Limited, the Sheffield steelmakers, has joined the board of Walter Spencer & Company, Limited, manufacturers of high-speed steel, twist drills, etc., of Sheffield.

MR. T. H. COLE and MR. C. G. GREEN have been appointed to the board of Jonas & Colver (Novo), Limited, steel manufacfurers, of Sheffield. (The company is owned by the Neepsend Steel & Tool Corporation, Limited, Sheffield.)

MR. H. W. BOSWORTH has retired from the position of managing director of Lancashire Dynamo & Crypto, Limited, Manchester, after 43 years' service with the company. He will continue to act as chairman of the company and will remain a director.

STRACHAN & HENSHAW, LIMITED, Bristol, has received a contract to the value of approximately £130,000 from A/S Norsk Jernverk, Oslo, for the raw materials handling equipment to the pig-iron smelting furnaces for its new project at Mo-i-Rana in northern Norway.

MR. WILLIAM HENRY GARDINER, chief maintenance engineer of W. H. Dorman & Company, Limited, manufacturing engineers and ironfounders, of Stafford, has retired after 34 years' service with the company. Mr. Gardiner, who is 74, started work as an errand boy when he was 11. He was awarded the M.B.E. last year.

MR. C. W. BLOOMFIELD has relinquished the chairmanship of Hackbridge Cable Holdings, Limited, but will continue in active control of the group's affairs as managing director. MR. CLAUDE I. STEEN, deputy chairman, has been elected chairman, and MR. A. L. FOULGER, secretary, has been appointed to the board of the company.

SIR CLAUDE D. GIBB, chairman of C. A. Parsons & Company, Limited, turbine manufacturers, of Newcastle-upon-Tyne, has left for India to attend the official opening of the new Cossipore power station. The company's contribution to the station has included a 2,500-kW., a 50,000-kW., and two 30,000-kW. turbo-alternators.

MR. JAMES STEEL, a director of Steel's Engineering Products, Limited, Sunderland ,is to make a three-month tour of India, Pakistan, Malaya, Ceylon, Burma, Siam, and Indonesia to expand the company's trade. A number of contracts for firms in these countries is being negotiated ,and Mr. Steel will be able to make on-the-spot decisions.

MR. CECIL C. HIGGENS, sales director of Tanway, Limited, lubrication equipment engineers, of Barnby Dun, Doncaster, is now residing at 24, Manor Road, Upper Beeding (Sussex). He has removed from Doncaster in order that he might be able to give closer personal attention to the company's expanding business in London and the South. He will, however, make periodical visits to the North.

MR. A. E. C. GREGG has been appointed managing director of Associated British Oil Engines (Marine), Limited, the company which has been formed to provide a joint selling organisation for all oil engines made by the A.B.O.E. group intended for ship board use. For the last two and a-half years Mr. Gregg has been superintendent engineer of the steamers section of the Sudan Railways at Khartoum.

MR. J. W. HARGREAVES, who recently retired from the position of general manager of the Renfrew and Dumbarton works of Babcock & Wilcox, Limited, engineers and contractors, has been succeeded in this position by MR. I. M. LYON, who was previously assistant general manager. MR. A. S. PEACOCK has been appointed assistant general manager. He previously held the position of manager of the industrial sales section in the London office of the company.

MR. TOM GAUNT, managing director of Joseph Tyzack & Son, Limited, saw manufacturers, etc., of Sheffield, has retired, but remains on the board in an advisory capacity. Mr. Gaunt joined the firm in 1918 as works manager, later becoming general manager and director. He was appointed managing director in 1943. MAJOR GARNET WILLIAMS, who is 29 years of age, and who is the firm's assistant general manager, has been appointed a director and general manager.

NEW YEAR HONOURS LIST

Further Names of Industrialists

Last week, details of a few of the awards in the New Year Honours were published. What follows is a more complete list of prominent industrialists and men with foundry associations who figured in the official citations.

Knights Bachelor

Mr. Colin Skelton Anderson, president of the Chamber of Shipping of the United Kingdom; Prof. Arthur Lyon Bowley, for services to the study of statistics and economics—he is a lecturer at the London School of Economics and Political Science; Mr. Cuthbert Barwick Clegg, vice-president of the British Employers' Confederation; Mr. Harold Vincent Tewson, general secretary of the Trades Union Congress—he has been a member of the Economic Planning Board since 1947.

Order of the Bath

C.B.

Mr. Robert Lowe Hall, Director of the Economic Section of the Cabinet Office and a member of the Economic Planning Board since 1947; Mr. Stewart Scott Hall, Director-General of Technical Development (Air) of the Ministry of Supply; Mr. Owen Haddon Wansbrough-Jones, scientific adviser to the Army Council; Mr. Victor George Shepheard, Deputy Director of Naval Construction, Admiralty.

Order of St. Michael and St. George

C.M.G.

Mr. Alexander Kirkland Cairncross, lately economic adviser, Board of Trade.

Order of the British Empire

K.B.E.

Mr. Frederick Brundrett, Chief of the Royal Naval Scientific Service.

C.B.E.

Mr. John Anderson, chief scientist, H.M. Underwater Detection Establishment, Portland; Mr. J. J. Gracie, chairman of the Greater Birmingham Local Employment Committee, general manager of the Witton works of the General Electric Company, Limited, and a director of several subsidiary companies, and a past president of the Institute of Welding; Mr. Norman Harry Jones, H.M. Deputy Chief Inspector of Factories, Ministry of Labour and National Service; Mr. Frank Morgan Owner, chief engineer of the engine division of the Bristol Aeroplane Company, Limited; Mr. Henry Russell, lately Director of Aluminium House Production, Ministry of Supply; Mr. Leslie George Semple, lately Controller-General, Post and Telecommunications, Control Commission for Germany, British Element (now Regional Director, North-Eastern Region, General Post Office); Mr. Kelvin Tallent Spencer, Deputy Director, Aircraft Research and Development (Technical), Ministry of Supply; Prof. Arthur Mannering Tyndall, F.R.S., chairman of the executive committee of the National Physical Laboratory.

O.B.E.

Mr. Richard Milroy Clarkson, assistant chief engineer (aircraft) and chief of the aerodynamics department of the De Havilland Aircraft Company, Limited; Mr. Samuel Dunlop, secretary of Belfast Chamber of Trade; Mr. Edward Ellis, joint manager of the repairs department of John I. Thornycroft & Company, Limited, engineers and shipbuilders, etc., of London, S.W.1; Mr. John Victor Foll, managing director of Muirhead & Company, Limited, telegraph and electrical engineers, of Beckenham (Kent); Mr. Tom Golding, manager of the electrical department of W. H. Allen, Sons & Company, Limited, Bedford; Mr. Tom Goodey, F.R.S., senior principal scientific officer of Rothamsted Experimental Station; Mr. John Arthur Gregorson, lately Assistant Director of Ordnance Factories, Ministry of Supply; Dr. Ezer Griffiths, F.R.S., senior principal scientific officer of the Department of Scientific and Industrial Research, and formerly principal scientific officer in the physical laboratory of the National Physical Laboratory; Mr. John William Howlett, vice-chairman of the Southern Regional Board for industry, chairman and managing director of Wellworthy Piston Rings, Limited, and a director of Associated Engineering Holdings, Limited; Mr. Francis John Lane, transmission design engineer of the British Electricity Authority; Mr. Leopold Leighton, lately engineer-in-chief of the Mersey Docks and Harbour Board; Mr. Harold John Lloyd, secretary of the Agricultural Engineers' Association; Brig. Norman Fredric Patterson, chairman of the North Wales Committee of the Welsh Board for Industry and production manager of Monanto Chemicals, Limited, at Ruabon and Newport; Mr. John Edwin Richardson, engineering manager of Vickers-Armstrongs, Limited, Barrow-in-Furness

M.B.E.

Mr. Gilbert Horatio Aldred, chief engineer of British Ropes, Limited, Doncaster; Mr. Ernest Victor Balsom, secretary of the Institution of Sanitary Engineers; Mr. Alfred Sidney Brown, manager of the electrical department of Clarke, Chapman & Company, Limited, manufacturing marine engineers, iron-founders, etc., of Gateshead; Mr. Arthur Edwin Brown, assistant engineer inspector, Admiralty; Mr. Philip Henry Durham, lately higher clerical officer, Department of Scientific and Industrial Research; Miss Olive Mary Forbes, chief superintendent of women employees of Ferranti, Limited, manufacturing electrical engineers, of Hollinwood (Lancs); Mr. John Goldsbrough, assistant to the technical director of the Furness Shipbuilding Company, Limited, Haverton Hill-on-Tees (Co. Durham); Mr. Archibald Newbigging Grierson, chief draughtsman of David Rowan & Company, Limited, marine engineers, etc., of Glasgow; Mr. Arthur Joseph Hewitt, superintendent of gas-turbine aero-engine development of Armstrong Siddeley Motors, Limited, Coventry; Miss Constance Mabel Hickling, personnel manager of John Bright & Bros., Limited, belting manufacturers, of Rochdale; Mr. Edgar Nathaniel Hiley, general secretary of the National Brassfoundry Association; Mr. William Holroyd, secretary of the East and West Ridings Regional Board for Industry; Mr. Thomas

Hosking, senior experimental officer, Admiralty; Mr. Gordon Rushworth Howells, Chemist 1, Atomic Energy (Production) Division, Ministry of Supply; Mr. Ernest Hoyle, chief draughtsman of the Telecommunications Research Establishment of the Ministry of Supply; Mr. Joseph Anthony Hunt, chairman of the Birmingham Advisory Committee of the Midland Regional Board for Industry; Mr. Stanley Edward Hutson, senior experimental officer of the Armament Research Establishment of the Ministry of Supply; Mr. Herbert Keeling, production manager of Job Wheway & Son, Limited, manufacturers of electrically welded steel chains, etc., of Walsall (Staffs); Mr. David King, chief armament designer of the De Havilland Aircraft Company, Limited; Mr. Kenneth Bernard Ling, superintendent, Standard Telephones & Cables, Limited, Treforest; Mr. Charles Smith Brown McLarty, factory manager of Alexander, Fergusson & Company, Limited, lead smelters, etc., of Glasgow; Mr. William George Masters, senior technical officer, Royal Mint; Mr. Philip Alexander Nelson, secretary and technical adviser of the South Coast Engineering and Shipbuilding Employers' Association; Mr. Anthony Proctor, manager of the oil-seal department of Geo. Angus & Company, Limited, Newcastle-upon-Tyne; Mr. Ninian Hill Scarth, manager of the engine department of Yarrow & Company, Limited, shipbuilders, etc., of Glasgow; Mr. Arthur George Sjogren, chairman of the Bedfordshire District Committee of the Eastern Regional Board for Industry; Mr. Herbert Charles Stevens, heavy forge manager of William Jessop & Sons, Limited, Sheffield; Mr. Geoffrey William Warren, physicist in the research laboratories of the General Electric Company, Limited; Mr. Alan Willsher Weekes, industrial member of the Coventry and District Committee of the Midland Regional Board for Industry; Mr. Cecil James Whittall, in charge of the Admiralty division of Elliott Bros. (London), Limited, manufacturers of electrical measuring instruments, of Lewisham, London, S.E.13; Mr. Thomas Haydn Williams, mill manager and chief roll designer of the Cargo Fleet Iron Company, Limited, Middlesbrough; Mr. Herbert Walter Wilson, Admiralty liaison engineer of the General Electric Company, Limited, Birmingham; Mr. John Wilson, chief draughtsman of the Admiralty drawing office of Harland & Wolff, Limited, Belfast.

British Empire Medals

Mr. J. Banks, fitter and turner, James Troop & Company, Limited, engineers and shipbuilders, etc., of Liverpool; Mr. L. Bearne, technician, Grade III, Military Engineering Experimental Establishment, Ministry of Supply, Christchurch (Hants); Mr. J. A. Coles, accident prevention officer, English Electric Company, Limited, Rugby; Mr. W. A. E. Daborn, shop foreman, Submarine Cables, Limited, East Greenwich, London, S.E.10; Mr. A. P. Dyer, senior assistant (scientific), Department of Scientific and Industrial Research, Watford; Mr. F. W. Edgell, universal miller, Bristol Aeroplane Company, Limited; Mr. F. Gillespie, head foreman ironman, Tyne Dock Engineering Company, Limited, South Shields; Mr. H. J. Gowing, chargehand, Dennis Bros., Limited, manufacturers of vehicles, lawn mowers, etc., of Guildford; Mr. G. W. Harris, scaler and annealer, Jury Holloware (Stevens), Limited, Brierley Hill (Staffs); Mr. W. Hatherly, foreman shipwright, Vosper, Limited, engineers and ironfounders, etc., of Portsmouth; Mr. J. Howard, skilled fitter, Guest, Keen & Nettlefolds (Midlands), Limited, Smethwick; Mr. A. Howie, chargeman, Imperial Chemical Industries, Limited, Saltcoats; Mr. C. J. Innocent, fitter, Armstrong Siddeley Motors, Limited, Coventry; Mr. W. Kellie, repair manager (steelwork), Ardrossan Dockyard, Limited, Ardrossan (Ayrshire); Mr. L. Lewis, leading hand, Mond Nickel Company, Limited, Swansea; Miss M. H. Lewis, blackplate opener, Richard Thomas & Baldwins, Limited, Port Talbot; Mr. J. Morris, head foreman riveter, Greenock Dockyard Company, Limited, Greenock; Mr. T. Nicholls, foreman mason, Baglan Bay Tinplate Company, Limited, Briton Ferry, Neath; Mr. H. Parker, senior fitter, Vaughan Crane Company, Limited, Manchester; Mr. G. Rees, mill superintendent, Steel Company of Wales, Limited, Swansea; Mr. J. Robinson, senior moulder, Head, Wrightson & Company, Limited, Thornaby-on-Tees (Yorks); Mr. N. Sturdy, chargehand, anhydrous ammonia filling station, Imperial Chemical Industries, Limited, Billingham (Co. Durham); Mr. W. T. Trezise, chargehand plater, Silley Cox & Company, Limited, Falmouth; Mr. F. Tune, foreman bricklayer, Appleby-Frodingham Steel Company, Scunthorpe; Mr. C. Turner, machine-tool fitter, Dowty Equipment, Limited, Cheltenham; Mr. J. L. Warlow, foreman of shipyard, Hancocks Shipbuilding Company (Pembroke), Limited.

Exchange of Scientific Information

O.E.E.C. Plan Becomes Operative

The scheme for the exchange of Government-published scientific and technical literature between O.E.E.C. countries comes into operation on Sunday. The scheme provides for the free supply by each of the Governments concerned to each of the others of up to six copies of all Government documents which are published on or after January 1, 1950, and which deal with the following questions:—(*a*) Physical and biological sciences, in so far as the material is likely to be of direct or indirect interest to industry; (*b*) any branch of technology; (*c*) medical matters of industrial interest; (*d*) economic questions relating to industrial productivity and among these particularly statistical material.

Seven countries have already agreed to take part in the scheme, namely, Austria, Denmark, France, Holland, Italy, Norway, and the United Kingdom, and other countries will join in as soon as they can complete their arrangements. Individual arrangements already exist for the exchange of Government literature between the United Kingdom and some European countries. It is not intended to interfere with these arrangements, but rather to provide a complementary service which will help to ensure that information of interest to industry is made as accessible as possible.

Each member country has been asked to name a central clearing house which will be responsible for the selection and despatch of outgoing reports and documents and the receipt and dissemination of incoming material. The Technical Information and Documents Unit of the Board of Trade, 40, Cadogan Square, London, S.W.1, will undertake this work on behalf of the British Government.

AT THE THIRD annual Christmas dinner and party given by Follsain-Wycliffe Foundries, Limited, Lutterworth, to their workpeople, a number of long-service awards were made to employees with 30 years' service and over with the company. Mr. Geoffrey Taite, director, one of the founders of the company, presented inscribed tankards to 26 employees who qualified for the awards.

News in Brief

THE ADDRESS of the Furnival Steel Company, Limited, is now Furnival Steel Works, Attercliffe Road, Sheffield, 4.

ZINC-OXIDE MANUFACTURERS announce that, consequent upon the increased zinc prices, the prices of zinc oxide, in lots of not less than 2 tons, delivered buyers' premises, have been increased by £1 15s.

HUNSLET ENGINE COMPANY, LIMITED, locomotive manufacturers, of Leeds, have received from South Africa an order for four 200-h.p. Diesel locomotives, each weighing 30 tons, and worth £40,000.

THE EXPORT OF GOODS (CONTROL) (CONSOLIDATION) ORDER, 1949, which came into operation on January 7, brings up to date the previous Consolidation Order (1948) and all subsequent amendments.

ROWHEDGE IRONWORKS COMPANY, LIMITED, Colchester, have received an order for a Diesel-driven passenger and cargo sternwheeler for the Sudan Government. This will be the first vessel built by the company since the end of the war.

LT-COL. J. P. HUNT, managing director of the Hallamshire Steel & File Company, Limited, Sheffield, who recently returned from a three-week tour of Canada and the United States, has stated that there is a considerable market in Canada for tools and good-quality cutlery.

THE TREASURY has made an Order under Section 21 of the Finance Act, 1948, exempting immediately from purchase tax breakdown vehicles which are fitted with a crane or lifting device. The Order will have to be laid before the House of Commons for approval within 28 Parliamentary days.

MARSHALL PLAN OFFICIALS have authorised $2,160,000 to Britain for American construction and mining equipment to be used in a British oil refinery project. The move comes after drastic curtailment by the United Kingdom of purchases of oil from the United States as output by 50 per cent.

THE OFFICES of the Consolidated Zinc Corporation, Limited, the Zinc Corporation, Limited, the Imperial Smelting Corporation, Limited, New Broken Hill Consolidated, Limited, the Broken Hill Corporation, Limited, and the Sulphide Corporation, Limited, are now at 9, Basinghall Street, London, E.C.2.

THE DOLLAR EXPORTS BOARD announces that its chairman, Sir Cecil Weir, will leave for a short visit to the United States and Canada on January 13. He will be accompanied by one of the joint general managers of the Board, Mr. R. R. D. McIntosh, and is expected to return about February 5.

THE REPUBLIC OF IRELAND imported iron and steel and manufactures (excluding cutlery and machinery) to a total value of £570,034 in October last, against £508,206 in the corresponding month of 1948. The total value of these imports for the first 10 months of 1949 was £5,524,822, against £5,378,185 in 1948.

BRUSH ELECTRICAL ENGINEERING COMPANY, LIMITED, Loughborough, has assumed control of Hopkinson Electric, Limited, Cardiff. It is reported that, as far as possible, it is proposed to continue the same line of manufacture at the Welsh factory as hitherto, and it is anticipated that there will be a steady increase in the number employed during the year.

AN ORDER for two 20,000 kVA. banks of transformers, 66/11 kV., complete with "on-load" tap-change gear, has been received by the Brush Electrical Engineering Company, Limited, through their agents, Clyde Engineering Limited, Wellington, N.Z. The transformers are destined for the Papanui sub-station of the State Hydro-Electric Department, N.Z.

RESERVATION LISTS for space in the Industrial Finishes Exhibition to be held at Earls Court, London, from August 30 to September 7, 1950, will be closed very shortly. Following discussions with the trade, the Exhibition has been shortened to eight days and the cost of space reduced to 10s. per sq. ft. Further information may be obtained from Industrial Finishes Exhibition, Limited, 26, Old Brompton Road, Kensington, London, S.W.7.

OUTPUT RECORDS at the Redcar steelworks of Dorman, Long & Company, Limited, were again broken last month, when the average weekly ingot production was 10,264 tons, compared with 10,181 tons in the best week previously recorded. The plate mills also reached a record weekly output of 5,590 tons of sheared plates. The November average was 5,575 tons per week, so that the average over a period of nine weeks was 5,581 tons.

RICHARDSONS, WESTGARTH & COMPANY, LIMITED, marine engineers, etc., of Hartlepool, and Sulzer Bros. (London), Limited, have signed an agreement by which George Clark (1938), Limited (an associate of Richardsons, Westgarth & Company), Southwick, are to manufacture Sulzer engines for land installations. The Southwick works will thus be the only engineering works at Sunderland engaged in the construction of engines of this type.

C. A. PARSONS & COMPANY, LIMITED, manufacturers of turbines, etc., of Newcastle-upon-Tyne, have agreed, at the request of the British Electricity Authority, to extend their normal range of products to include the fabrication of high-pressure pipework. The company will now undertake the supply, fabrication, and erection of all pipework and other equipment required to connect steam boilers to turbo-alternators. This will include steam and water lines.

THE ADVERTISING ADVISORY COUNCIL, set up at the request of the Dollar Exports Board, has now completed its preliminary surveys, and has worked out a system by which its services will be made available to all British exporters to the United States. The Council has established temporary offices at 40, Berkeley Square, London, W.1. All inquiries by intending exporters should be addressed to Mr. David W. James, the acting secretary.

A NEW COMPANY, Marshall & Anderson, Limited, with a capital of £300,000, has been formed to acquire not less than 90 per cent. of the shares of two Motherwell boilermaking companies—the Broomside Boiler Works Company, Limited, and Alex. Anderson & Sons, Limited. The object of the amalgamation is to develop the main lines of production, which consist of all types of boiler from those for locomotives to small marine Class I fusion-welded pressure vessels.

MORE PRODUCTION RECORDS have been achieved by North-East Coast steelworks. With an ingot output of 224,200 tons in 1949, the Skinningrove Iron Company, Limited, beat their previous best in 1948 by 8,000 tons and last week the Cargo Fleet Iron Company, Limited, achieved a total production of 8,036 tons of ingots, compared with the previous record of 7,635 tons. This company's two blast furnaces also created a record for the week with 4,781 tons; their previous best was 4,600 tons.

MR. W. E. LOVERIDGE, a director of Richardsons, Westgarth & Company, Limited, marine and turbine engineers, etc., of West Hartlepool, has stated that the company has orders in hand for 1950 to the total value of £9,000,000—the highest figure in the history of the firm. The greater proportion of the orders is for power-station equipment for the British Electricity Authority. Marine work includes a number of Diesel engines and a set of geared turbine machinery for a new Cunard White Star liner.

European Steel Production Programme

Prospects for 1953

A surplus of 8,000,000 tons of steel may not find a market in 1953 if current plans for European steel production are implemented. This is one of the main conclusions reached in a report entitled "European Steel Trends in the Setting of the World Market," prepared by the secretariat of the Steel Division of the United Nations Economic Commission for Europe.

It is pointed out that if the individual steel production plans of European countries (excluding the U.S.S.R.) are added together, a total production is arrived at in 1953 of 70,000,000 tons. As against this, after an exhaustive examination of possible steel consumption in which various different approaches were employed, the Steel Division secretariat arrives at the conclusion that the "practical" maximum consumption within Europe in 1953, provided it is a year of full employment, will be 58,000,000 tons.

An extensive survey of world producing and consuming areas further reveals that the maximum that Europe is likely to be able to export to oversea markets in 1953 is 4,100,000 tons, which represents 80 per cent. of the estimated oversea import requirements of some 5,000,000 tons. Thus the total demand for European steel in 1953 is not expected to exceed 62,000,000 tons, leaving a surplus of about 8,000,000 tons of crude steel.

Prices of Raw Materials

In order to achieve an efficient self-supporting European economy, which would permit a high level of steel consumption and enable Europe to recapture an 80 per cent. share of the world's steel markets, the prices of raw materials in Europe, the report states, would have to be reduced and her production efficiency improved by suitable modernisation of plant and equipment. With the exception of manganese ore, Europe as a whole could be self-sufficient on an economic basis, so far as steelmaking raw materials are concerned, and it therefore lies in her power to improve her efficiency.

On the other hand, the report shows that practically no European country can effectively develop an independent and self-sufficient steel industry, for the reason that each of them must remain dependent on some other country for its supplies of one or several of the raw materials necessary for the production of steel. A general factor explaining what the report designates "over-optimistic steel production planning," which promises to give rise to an 8,000,000-ton surplus in 1953, is the "lack of contact and exchange of information among the people responsible for making the plans in various countries," and the "absence of international co-operation on a Europe-wide basis."

Discussing the consequences of 100 per cent. fulfilment of the present plans, the Steel Division secretariat declares that in 1953 there would be produced "cut-throat" competition among steel producers which might well force out of business some efficient producers relying on a high proportion of export trade, while less efficient producers might continue to produce for national consumption at high prices, protected by tariff walls. It is pointed out that it is impossible to produce economically the whole range of basic-steel products in a unit with much less than a 2½ to 3 million-ton capacity per year—yet some countries with an annual consumption of half a million tons annually are planning their own steel production.

Construction of New Plants

A considerable proportion of new steel production capacity is to be brought about by extending and modernising existing plants. It is estimated, however, that the present plans call for the building of entirely new steelworks of a total effective capacity of 3 to 4 million tons. To construct a new steel plant with a capacity of 1 million tons a year would in Europe involve an investment of between $200 and $300 million. It is obvious that money spent or to be spent on increasing production capacity which would create an unmarketable surplus of 8,000,000 tons of steel, could be better invested in other more productive fields and, in particular, in the development of steel-consuming industries, states the report.

Discussing possible remedies for the problems facing the European iron and steel industry, the secretariat proposes that:—(*a*) Co-ordinated measures should be studied and applied in order to increase steel consumption when signs of under-consumption or recession appear; (*b*) steel-investment and production programmes should be co-ordinated in order to ensure an overall satisfactory level of crude steel production and an adequate supply in each of the main categories of rolled or drawn-steel products; (*c*) co-operation among European countries should ensure adequate supplies of good-quality and cheap raw materials for steelmaking; (*d*) wide exchange of information on improvements in steel-producing techniques, on measures taken to increase productivity, etc., should be organised; (*e*) the evolution of the European and even of the world market situation from the point of view of steel production and consumption ought to be studied periodically so as to determine, in time, factors which might influence the various decisions to be taken.

United Steel Companies' Output Record

All Branches Exceed Targets

Output of the United Steel Companies, Limited, in 1949 totalled 2,064,200 tons of steel ingots and 1,135,551 tons of pig-iron and ferro-alloys. The record steel output set up in 1948 has been beaten by 86,000 tons.

The Steel, Peech & Tozer branch, at Rotherham, produced 782,614 ingot tons, beating the 1948 record by 58,000 tons. The 1948 output itself was 80,000 tons better than ever before. The Appleby-Frodingham branch, at Scunthorpe, made 832,292 tons last year, and thus beat its record of 828,895 tons achieved in 1948. Samuel Fox & Company, Limited, at Stocksbridge, made 211,223 tons, including a substantial proportion of alloy steel, and raised its record for the second year running, this time by 10,000 tons. The Workington branch, in Cumberland, in spite of major plant alterations involving a six-weeks' stoppage, produced 238,071 tons, which was better than 1948 and only 10,000 tons less than its record output in 1937.

All the branches exceeded the targets they were set in the industry's output programme for the year.

THE COPPER and tinplate works, Michael Niederkirchner, Ilsenburg, East Germany, is to be doubled in size at a cost of 8,500,000 DM.

FALKIRK IRON COMPANY, LIMITED, are to re-roof the pipe-testing shop at Castlelaurie Iron Works, re-roof the moulding shop at the same works, and to erect a shelter over the roadway between the new fitting shop and grinding mill at Falkirk Iron Works. The total cost is expected to be of the order of £5,000.

New Companies

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

R. E. D. ENGINEERING, 4A, East Street, Prittlewell (Essex)—£3,000. C. L. Devereux.

LIBREX LEAD COMPANY—£100. K. H. Johnson, Laindon Frith, Billericay (Essex), subscriber.

COOKSON LEAD & ANTIMONY COMPANY—£100. K. H. Johnson, Laindon Frith, Billericay (Essex).

GRAFTON FOUNDRY (KEIGHLEY)—£10,000. W. and W. Usherwood, Wynburn, Denby Dale Road, Wakefield.

T. B. PEARSON & SONS, Wincomblee Road, Walker, Newcastle-upon-Tyne—Engineers, etc. £30,000. N. and R. Pearson.

MICHAEL BAUM & COMPANY, 74, Borough Road, Middlesbrough—Ironfounders, smelters, etc. £4,000. M. M. and J. Baum.

WALTER R. SKUSE & PARTNERS, 42, Kilburn High Road, London, N.W.6—Ironfounders, etc. £5,000. W. R. and M. M. Skuse.

O. E. BECK, 22, Northwood Street, Birmingham—Die sinkers, toolmakers, etc. £6,000. E. M. Beck, C. I. Willetts, and M. E. Nation.

BOUELLAT ENGINEERING, 167-8, Millbank, London, S.W.1—£3,000. K. M. Blanhorn, W. T. Tenton, G. Hudson, and P. F. Bouellat.

C. H. MILLER (ENGINEERS), 49A, Stafford Street, Birmingham, 4—£15,000. C. H. and L. E. E. Miller, and R. T. W. Smalley.

LIBERTY ENGINEERING SUPPLIES, 1A, Colliers Wood, High Street, London, S.W.19—£5,000. T. Schlaefli, T. H. J. Mines, and C. H. Whittle.

LOCKE, LANCASTER & W. & R. JOHNSON & SONS—Lead and metal merchants, etc. £100. K. H. Johnson, Laindon Frith, Billericay (Essex), subscriber.

DAWSON BENTLEY & COMPANY, Dalton Works, Dalton Lane, Keighley—Ironfounders. £20,000. J. Lund, C. Waller, J. Hale, S. Lightowler, and H. E. Scott.

W. GWENNAP (AGRICULTURAL), 55, Wolverhampton Road, Stafford—Agricultural and general engineers, etc. £15,000. W. Gwennap and F. J. Williams.

JASONS (EQUIPMENT), The Grange, Chertsey (Surrey)—Manufacturers of engineering spare parts, assemblies, and equipment, etc. £10,000. J. R. and K. H. Johnston.

DRAKES (ENGINEERS), Shay Lane, Ovendon, Halifax—To take over the business of engineers and ironfounders carried on by Drakes. £50,000. J. A., F. D., and E. M. Drake.

EATON & BOOTH, Owlerton Bridge Steelworks, 608, Penistone Road, Sheffield—Ironmasters, steel manufacturers, etc. £40,000. J. H. and J. E. Trickett and A. E. Brookes.

RUBERY OWEN KEPSTON, 44-48, Shepherdess Walk, City Road, London, N.1—Manufacturers of V. groove and other pulleys and equipment, etc. £50,000. B. Greene, A. G. P. and E. W. B. Owen, R. J. A. Hamer, P. T. Lovely and C. E. Partridge.

JARDINE (LONG EATON)—Engineers and manufacturers of machinery, etc. £3,000. Sir J. Jardine, 7, Cavendish Crescent North, The Park, Nottingham, G. Thomson, and B. H. Wallis.

SMITH & GRACE (SALES)—Manufacturers of engineering, coal, electrical and metal machinery, etc. £10,000. F. J. Walters, 10, Derwent Avenue Kingston Vale, London, S.W.15; E. F. C. and J. A. Smith.

DRAYTON REGULATOR COMPANY (HOLDINGS)—To acquire not less than 90 per cent. of the issued share capital of the Drayton Regulator & Instrument Company and to carry on business of mechanical engineers and manufacturers of machinery, etc. £100. E. Lyall, 18, Austin Friars, London, E.C.2, subscriber.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference E.P.D. or C.R.E. can be obtained from the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1.

JARROW, February 1—Cast-iron goods, for the Borough Council. The Borough Engineer, Town Hall, Jarrow.

RADCLIFFE, March 1—Iron castings, for the Borough Council. The Borough Engineer and Surveyor, Town Hall, Radcliffe.

YORK, January 27—Castings (iron, brass, etc.), for the City Council. Mr. C. J. Minter, city engineer and architect, Guildhall, York.

CORNWALL, January 30—Tools, cast-iron gully gratings, frames and weirs, etc., for the County Council. The County Surveyor, County Hall, Truro.

SWANSEA, February 4—Iron and steel, scrap metal, castings, etc., for the Borough Council. The Borough Engineer and Surveyor, Guildhall, Swansea.

Company Results

(Figures for previous years in brackets.)

SILENTBLOC—Interim dividend of 12½% (same).

WAYGOOD-OTIS—Interim dividend of 20% (same).

WAGON REPAIRS—Interim dividend of 10% (same).

SMITH & WELLSTOOD—Interim dividend of 5% (same).

COZENS & SUTCLIFFE (HOLDINGS)—Interim dividend of 10% (same).

T. M. BIRKETT & SONS—Interim dividend of 5% on increased capital (7½%).

WORTHINGTON-SIMPSON—Interim dividend of 10% (nil). The board has decided to pay an interim dividend owing to delay in completing the accounts.

SHEEPBRIDGE COMPANY—Interim dividend of 3%, tax free, on the preference and ordinary capital as halved in March last (3%, tax free, on the old capital).

HARRISON, McGREGOR & GUEST—The directors have decided to withhold payment of the dividend due on January 1 on the 5 per cent. cumulative preference shares. The arrears date from December, 1947.

H. & J. QUICK—Trading profit for the year to September 30, 1949, £50,180 (45,365); net profit, after depreciation, tax, etc., £15,221 (£14,472); final dividend of 17½%, making 32½% (same); forward, £35,074 (£29,003).

VENESTA—Trading profit and miscellaneous receipts to June 30, 1949, less expenses, £336,568 (£389,232); net profit after depreciation, tax, etc., £124,750 (£133,291); to general reserve, £75,000 (£85,643); initial allowances reserve, £3,500 (nil); dividend of 10% (same); forward, £76,822 (£76,140).

CONSTABLE HART & COMPANY—Consolidated trading profit, etc., for the year to September 30, £65,080 (£90,350); net profit, after depreciation, taxes, etc., £15,015 (£20,628); tax, etc., provisions freed, £14,925 (£764); dividend of 6% (8%); special taxation in respect of initial allowances, £21,000 (£6,900); forward, £25,879 (£25,803).

POWER-GAS CORPORATION—Consolidated trading profit to September 30, including estimated profit on work in progress, £337,918 (£267,221); net profit, after depreciation, tax, etc., £86,655 (£60,210); parent company's net profit, £86,655 (£60,210); to general reserve, £59,000 (£32,000); dividend of 12½% (same); forward, £38,143 (£37,988).

MANN, EGERTON & COMPANY—Consolidated net profit to September 30, after tax, etc., £67,879 (£89,018); to fixed assets replacement and reserve, £10,000 (same); stock depreciation reserve, £10,000 (£20,000); general reserve, £20,000 (same); dividend equalisation, nil (£10,000); dividend of 50% and bonus of 30% (same); forward, £38,214 (£35,229).

Changes of Name

The following companies have recently changed their names, the new titles being given in parentheses:—

CHAS. F. WEBB & SON, LIMITED, Birmingham (Castle Pipe Fittings, Limited).

KAYMET, LIMITED, machinery manufacturers, etc., of London, E.C.2 (Orly (Ewell), Limited).

ELECTRIC TRANSPORT & ENGINEERING PRODUCTS, LIMITED, Manchester (Exelene (Manchester), Limited).

BRITISH OIL ENGINES (EXPORT), LIMITED, Loughborough (Associated British Oil Engines (Export), Limited).

NORTHSIDE PRODUCTS, LIMITED, machinery manufacturers, etc., of London, W.9 (J. Wibolti & Company, Limited).

ROBERT DIXON (HUNSDON), LIMITED, manufacturers of agricultural implements and machinery, etc., of Hunsdon, near Ware (Robert Dixon, Limited).

ASHDAY FIRECLAY COMPANY, LIMITED, Bradford (Ashday Property Trust Company, Limited). At September 5, 1949, the Bradford Property Trust, Limited, held 1,800 shares out of 2,300 issued.

CUB OIL ENGINES, LIMITED, Loughborough, Leics (Associated British Oil Engines (Marine), Limited). At August 3, 1948, Brush Electrical Engineering Company, Limited, held practically all the issued shares.

COMECHAN, LIMITED, manufacturers of mechanical-handling equipment, etc., of London, S.W.1 (F. & G. (Carlswerk) Products, Limited). The Columeta Export Company, Limited, was allotted 4,998 shares out of 5,000 shares in February, 1949.

Gazette

HEWETT & SAGE (ENGINEERS), LIMITED, is being wound up voluntarily. Mr. C. G. Davidson, 7, Victoria House, High Road, Goodmayes, is the liquidator.

TETSTALL HOWARD & REA, LIMITED, engineers and ironfounders, is being wound up voluntarily. Mr. C. N. Rowe, 35, Foregate Street, Worcester, is the liquidator.

WINTERBOTTOM & WALSHAW, LIMITED, electrical engineers, is being wound up voluntarily. Mr. J. A. Hick, Wesley Chambers, Union Street, Dewsbury, is the liquidator.

Company News

The paragraphs below have been extracted from statements circulated to shareholders, speeches made at annual meetings, and other announcements.

Venesta, Limited, tea lead and tin foil rollers, of Silvertown, London, E.16 (MR. HENRY RUTHERFORD):—Considerable alterations to our Silvertown works to allow for the expansion of our aluminium foil production are in hand, and will take fully 12 months to complete. Much attention has been given to the layout of this department with a view to lowering the costs of production and avoiding unnecessary handling. The turnover of the company again showed an increase over the previous year. During the period under review our Calcutta factory was fully occupied in producing and delivering aluminium linings and fittings for tea chests. The Indian Government's import licensing policy for 1950 is still undecided, and it is too early to predict how seriously our trading business with that country will be affected. We have maintained our aluminium foil sales to the limit of our capacity and have devoted particular attention to research and to methods of production of the many new and expanding uses of foil. For some years we have expected an increase in the use of collapsible tubes made of aluminium instead of the customary tin or lead, and the present high prices for these metals have awakened an increasing interest in the aluminium tube. Recent months have shown a steady increase in our production of these tubes.

Midland Bright Drawn Steel & Engineering Company, Limited:—Ordinary shareholders registered on December 20 have been offered 250,000 further 1s. ordinary shares at 4s. each in the proportion of one for four. With reference to the acquisition by the company of Wilcox & Lines, Limited, manufacturers of hot brass stampings and pressings, of Birmingham, and M.C.L. & Repetition, Limited, manufacturers of motor-car lighting equipment, etc., of Oldbury, with the consequent broadening of the scope of the business, the directors state that the purchase prices for the two businesses, apart from an issue of 78,370 preference shares, have been financed out of resources and from bank overdraft, now amounting to approximately £118,350. The ordinary share issue, calculated to produce £47.800 net, will enable partial repayment of the overdraft. Publication of the accounts, it is stated, has been delayed by the need to publish group figures consequent upon the acquisition of these new interests.

Richard Crittall & Company, Limited, heating and ventilating engineers, etc., of Brentford (MR. G. C. R. ELEY):—A company which did not possess a record of solid achievements in the past could not have survived the blow which fell on the undertaking. The fact that it seemed reasonable, and proved possible, to reconstruct the company out of the ruins, and that important and valuable orders have been obtained since the receivership are the best evidence that the company is still fundamentally sound. Most of the company's old business relationships have been retained and valuable new contacts have been made. The board has applied itself to reducing overhead expenditure. The undertaking now has the means and the technical ability to enable the board to feel confident that the company is safe and on the right road.

Sheepbridge Company, Limited:—The directors propose to increase the borrowing powers of the company by a further £1,000,000 above the present limit of £777,330. The board states that the scheme for the erection of two new blast furnaces is making good progress, but, owing to extensions and other factors, the cost of the original scheme, estimated at approximately £1,500,000, has now been increased by some £950,000. It was intended that expenditure on the original scheme should be financed mainly out of payments of compensation in respect of the nationalisation of the collieries, but, due to the continued delay in the compensation proceedings, this has not proved possible and recourse must therefore be had to temporary borrowings.

English Electric Company, Limited:—The company has under consideration a programme of financing which includes an issue of debenture stock and a small rights offer of ordinary shares to the ordinary stockholders. This, the board states, will make it necessary to increase the authorised capital and, in view of the company's expanding business, the opportunity is being taken to obtain authority from the ordinary stockholders for a total ordinary share capital substantially in excess of what is now required for the issue contemplated. Accordingly it is proposed to increase the company's capital to £8 million by creating 1,500,000 ordinary £1 shares.

Gerrard Industries, Limited, manufacturers of steel strappings and strapping machines, of Brentford (Middx):—In an interim report the company states that with regard to the half-year ended September 30 last and in comparison with the corresponding period of the last financial year, consolidated sales show an increase both in value and volume. Consolidated net trading profit, subject to audit, has been maintained, notwithstanding more competitive trading conditions in export business and consequential lower margins of profit.

John Holroyd & Company, Limited, manufacturers of machine tools and gearing, etc., of Milnrow, near Rochdale:—At a meeting on Friday approval was given to an increase of capital from £150,000 to £500,000 by creating 1,400,000 ordinary shares of 5s. each and capitalising £50,000 in allotting 200,000 ordinary shares as a bonus isue in the ratio of one for every three ordinary shares held.

Corrosion in the Oil Industry

Development of Equipment in the U.K.

A joint committee was set up following discussions some time ago by the Council of British Manufacturers of Petroleum Equipment and the oil companies on the problem of corrosion in the oil industry. The committee has recently been discussing corrosion of furnace parts by combustion gases and the protection of buried and submerged structures. A statement issued on Tuesday by the Council says that in considering these subjects it has become increasingly evident that the major need is for the development of corrosion-engineering equipment in the United Kingdom, since the principal advances during the war years had been made in the United States.

The oil companies are particularly anxious to acquire this equipment from sterling sources, and agreement has been reached between them in principle as to the types of equipment most required. A detailed list is being prepared and, later, meetings between interested members and oil company representatives will be arranged.

U.K. Shipbuilding Prospects

IN a statement on the position and prospects of the United Kingdom shipbuilding industry, Mr. H. B. Robin Rowell, president of the Shipbuilding Conference, points out that, while the building yards completed 1,400,000 gross tons of new merchant ships in 1949—the highest total in any year since the war, 70 per cent. being for British account and 30 per cent. for foreign account—the intake of new orders during the year at 400,000 gross tons was less than one-third of the year's output of completed ships, so that the longer-term outlook is not without its anxieties. The value of the new shipbuilding output is reckoned to be not less than £115 million, so that direct export of new ships earned foreign exchange amounting to about £35 million, he says. The total order-book stands at 3¼ million gross tons—2 million on the berths or fitting out and 1¼ million still to be laid down—which means that many of the yards will continue to be busy in 1950 and in some cases for a longer period ahead. Mr. Rowell states that the boom conditions are undoubtedly over and in the course of the next 18 months to two years the process of readjustment to more normal conditions will be accelerated.

Beevor Iron Foundry

Last Thursday, using a silver key handed to him by Mr. R. C. Shepherd, Field Marshal Sir William Slim officially opened the Beevor Iron Foundry—an addition to the Lincoln works of Ruston & Hornsby, Limited. The outstanding characteristics of the new enterprise are the generous provision of elbow-room for the operatives (thus emphasising production per man-hour rather than per square foot) and the more than generous interpretation of the clauses of the "Garrett Report." The panel heating provided is, it is thought, an innovation in foundry practice; the provision of fresh air, the dust extraction at the points of creation and the washing and bathing facilities are alike the best that modern engineering can provide. The plant has been carefully chosen and fully integrated; this results in smooth and rapid operation. Mr. H. Riggall presided over the opening ceremony and he, along with other speakers, praised the work done by Mr. Shepherd and his chief assistant, Mr. A. Swain. Sir William Slim, in a brilliant address, compared the conditions in ironfoundries forty years ago with those obtaining in the Beevor Foundry. The foundry will be fully described in a future issue of the JOURNAL.

GENERAL IRONFOUNDERS' PRODUCTIVITY TEAM

THE GENERAL IRONFOUNDERS' PRODUCTIVITY TEAM, WHICH SAILED FOR AMERICA YESTERDAY IN THE MAURETANIA, TOURED FOUNDRIES IN THIS COUNTRY IN PREPARATION FOR ITS VISIT. ON JANUARY 4, SOME OF THE MEMBERS WERE AT THE FOUNDRY OF METROPOLITAN-VICKERS ELECTRICAL COMPANY, LIMITED, AND THERE THIS PHOTOGRAPH WAS TAKEN:—

Front Row (from left to right): Mr. F. D. Webb, secretary, Manchester and District Ironfounders Employers' Association; Mr. G. W. Nicholls,* general manager, foundries and patternshop, Modern Foundries, Limited; Mr. H. B. Farmer,* director and works manager, Rice & Company (Northampton), Limited; Mr. A. C. Main, assistant works manager, Metropolitan-Vickers Electrical Company, Limited; Mr. S. H. Russell,* director and chairman, S. Russell & Sons, Limited; Mr. A. Phillips, superintendent, foundries and patternshop, Metropolitan-Vickers Electrical Company, Limited; Mr. E. J. Ross,* foundry technician, G. & J. Weir, Limited, and Argus Foundry, Limited; Mr. A. Kirkham,* works manager, Sir W. H. Bailey & Company, Limited, and Mr. R. H. Lumsden,* patternmaker, Fraser & Chalmers Engineering Works. Second Row: Mr. W. Frith, assistant superintendent, foundries and patternshop, Metropolitan-Vickers Electrical Company, Limited; Mr. W. R. Marsland,* foundry technician, Newman, Hender & Company, Limited; Mr. M. Martin,* foundry foreman, Markham & Company, Limited; Mr. N. Charlton,* chief foundry metallurgist, C. A. Parsons & Company, Limited; Mr. J. Stewart,* moulder, A. F. Craig & Company, Limited; Mr. H. Hendy,* Davy & United Engineering Company, Limited; Mr. C. Blackburn,* moulder, T. H. & J. Daniels, Limited, and Mr. H. W. Grundy, assistant superintendent, foundries and patternshop, Metropolitan-Vickers Electrical Company, Limited. (*Team members)

STANTON-DALE

REFINED PIG IRON

Designed to meet the demands of high quality castings, which are, strength, machineability and resistance to wear.

All these can be secured by using Stanton-Dale Refined Pig Iron in your cupolas.

Tne above illustration shows a group of castings made by Messrs. Goodbrand & Co. Ltd., Stalybridge, Cheshire.

PROMPT DELIVERY

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

Raw Material Markets

Iron and Steel

Very few foundries can boast of heavy order-books, most of them relying on day-to-day demands for castings to maintain recent production levels. Consequently, competition is keen and a much wider sphere of activity is being undertaken for new business. Available tonnages of pig-iron are adequate for requirements and supplies of labour and other materials are satisfactory.

There has, however, been some tightening in supplies of low- and medium-phosphorus irons, presumably on account of the increased demand from foundries associated with the motor industry, which is experiencing an improvement in export trade. This has resulted in a more careful distribution of available supplies and recent allocated tonnages are lower than the quantities requested. Hematite continues to be in fair supply and most users are able to obtain their required tonnages, if not the desired analyses.

Supplies of high-phosphorus iron are more than sufficient to provide for current outputs of castings. It is anticipated that the new furnace now being built in Derbyshire will be in production before long; this will add considerably to the overall output and permit increased allocations to the foundries. There is no difficulty in obtaining refined iron and this is the only grade which continues to be exported.

Foundry coke continues to be delivered in adequate quantities and most works have some stocks. Ganister, limestone, firebricks, and ferro-alloys are coming forward freely.

Re-rollers, apart from the light mills producing the smallest sections and bars and narrow strip, and the sheet mills, are having difficulty in securing new orders. This is mainly due to the importation of large tonnages of finished steel products, and until present stocks are reduced and a curtailment in imports is imposed there is little likelihood of any improvement. Sheet mills are well employed and have sufficient work for both black and galvanised sheets to cover outputs for many months ahead. Steel semis supplies are satisfactory and it is difficult to dispose of any arisings of defective material, crops, etc.

A good tonnage of steel joists and sections has been carried forward from last year and more specifications are on offer; the keen demand for large joists and channels also continues. Small angles continue to be easy, but the position of the smallest sizes in flats and rounds is still governed by the supply of suitable billets, which is somewhat restricted. Strip and wire mills are working to capacity, but bright drawers are finding that the lack of suitable black bar is retarding their production.

Non-ferrous Metals

Trading in tin on the London Metal Exchange continues to be steady. In the three months since the market opened, however, a distinct improvement has been made, for the backwardation has narrowed from £80 to approximately £16. Undoubtedly the technical position is improving, but there is a long way to go yet before normal levels are achieved. However, all traders are looking forward to the day, not so far distant perhaps, when a contango obtains and encouragement is thereby given to operators to hedge against their holdings of metal. The price of tin has not yet reached a level at which merchants and others are prepared to hold stocks, but in due course no doubt that point will be reached; even then accumulations will probably be light unless hedging facilities are restored.

Last year was a period of heavy copper consumption, although the total for the 12 months will not reach the 1948 level. Despite the heavy fall, from £140 to £107 per ton in the spring, demand was well maintained and the November figures, published recently by the British Bureau of Non-ferrous Metal Statistics, confirm this view. Virgin copper usage increased from the October figure of 27,027 tons to 28,659 tons, while secondary copper advanced from 14,533 tons to 14,989 tons. Stocks of virgin copper fell from 143,867 tons to 136,606 tons at November 30. For the first 11 months of last year, United Kingdom consumption was 457,878 tons, compared with 497,059 tons in the corresponding period of 1948.

The scrap market continues to show strength and further advances have been registered in the prices of both copper and brass. Supplies of secondary copper are scarce and consumers are reported to be experiencing some difficulty in securing all the metal they require. In brass there is a fairly generous flow of Ministry of Supply disposals, which helps matters considerably.

Metal Exchange tin quotations were as follow:—

Cash—Thursday, £601 10s. to £602; Friday, £601 10s. to £602; Monday, £600 to £600 10s.; Tuesday, £600 to £600 10s.; Wednesday, £600 to £601.

Three Months—Thursday, £584 15s. to £585; Friday, £585 to £586; Monday, £583 to £583 10s.; Tuesday, £581 5s. to £581 10s.; Wednesday, £583 5s. to £583 10s.

Chrome Ore Selling Prices

The Ministry of Supply has announced the following selling prices for chrome ore, which came into operation on January 1. The prices include carriage charges to the nearest rail point consumer's works. The revised list cancels all previous announcements and indicates the grades available from January 1. Prices are per ton ex-ship and, in parentheses, per ton ex-store.

REFRACTORY:—Rhodesian Imperial grade, £11 3s. 6d. (£12 0s. 6d.); Transvaal, basis 44 per cent., scale 1s. 6d. (£8 15s.); Indian, basis 40 per cent., scale 1s. 6d. (£9 19s.); Turkish, basis 43 per cent., scale 5s., £13 16s. 3d. (£14 14s.).

METALLURGICAL:—Rhodesian lumpy, £11 9s. 6d. (£12 6s. 9d.); Baluchistan (£11 17s.); Rhodesian washed concentrates, £10 18s. 6d. (£12 18s. 9d.).

CHEMICAL:—Transvaal X.L., basis 50 per cent., scale 2s. 6d. above 50 per cent., £10 19s. 9d. (£11 19s.); Transvaal "A," basis 48 per cent., scale 2s. 6d. above 48 per cent., £9 11s. (£10 10s.); Transvaal concentrates, basis 48 per cent., scale 2s. 6d., £9 8s. 9d. (£10 7s. 6d.); Rhodesian Dyke chemical, £11 11s. (£12 6s. 3d.); Rhodesian Lalapanzi, basis 48 per cent., scale 2s. 6d. above 48 per cent. (£11 5s.); Rhodesian concentrates, basis 49 per cent., scale 2s. 6d., £9 1s. (£10); Indian chemical, basis 47 per cent., scale 2s., £8 12s. 6d. (£9 7s. 9d.); Baluchistan chemical (£11 17s.).

Furniculture

This is this year's title of a Christmas booklet issued by Birlec, Limited, Erdington, Birmingham, 24. It contains the following excellent example of mixed metaphors:—"That red herring has since chased many a wild goose to its mare's nest and is still pulling wool over the eyes of the furnace men to-day." It is time it was nailed down. It vies with the classical example of an Irish Member of Parliament who, referring to a potential plot on the other side of the House, said: "I smell a rat; I see it floating in the air; I'll nip it in the bud," as a masterpiece of woolly thinking. This glorious piece of nonsense well maintains the high standard of humour of earlier efforts, and we commend it to our readers for gloom dispersal.